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The Evaluation of Effect of Phototherapy on Serum Calcium Level

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Abstract:

Jaundice is one of the most common problem that can occur in the newborn. The study group included 30 neonates (15 term and 15 preterm) and control group included 20 neonates (10 terms & 10 preterm). All had hyperbilirubinemia. The controls were fully matched with the study group. All the neonates included in the study group required management with phototherapy. The neonates in the control group were managed without phototherapy. Measurement of ionized serum calcium level was done before and after 48 hours of institution of phototherapy in study groups and controls. Before phototherapy, there was no statistical significant difference in mean serum calcium level in term & preterm neonates of both study & control group. After 48 hours of phototherapy in study group, a significant fall in calcium level in 66.6% of term & 80% of preterm neonates was observed. Whereas, no difference was observed in control group. It is suggested that calcium level be assessed in neonates treated with phototherapy for more then 48 hours and managed accordingly.

Key Words: Hyperbilirubinemia, Phototherapy, Hypocalcemia.

Introduction:

Jaundice is an important problem in the first week of life. It is a cause of concern for the physician and a source of anxiety for the parents. High bilirubin level may be toxic to the developing central nervous system and may cause neurological impairment even in term newborns.

Nearly 60% of term new borns become visibly jaundiced in the first week of life. In most of cases, it is benign and no intervention is required. Approximately 5-10% of them have clinically significant hyperbilirubinemia in whom the use of phototherapy becomes mandatory.

Jaundice is attributable to physiological immaturity of neonates to handle increased bilirubin production. Visible jaundice usually appear between 24-72 hours of age. Basic pathophysiology of jaundice is same in term and preterm neonates, but premature babies are at a higher risk of developing hyperbilirubinemia.

The commonly known side effects of phototherapy are loose stools, hyperthermia, dehydration fluid loss, skin burn, photoretinitis, low platelet count, increased red cell osmotic fragility, bronze baby syndrome, riboflavin deficiency and DNA damage. A lesser known side effect, but potential complication of phototherapy is hypocalcemia (Hunter, 2004).

Neonatal hypocalcemia is defined as total serum calcium concentration of < 7 mg/dl or ionized calcium concentration of < 4mg/dl (<1mol/L). Ionized calcium is crucial for many biochemical processes, including blood coagulation, neuromuscular excitability, cell membrane integrity and function, and cellular enzymatic and secretory activity.

Romagnoli et al (1979) for the first time suggested the association of hypocalcemia with phototherapy in preterm newborns. Similarly Hakanson & Bergstrom (1981) documented this observation in newborn rats. There are few studies on hypocalcaemic effect of phototherapy (Tan, 1991; Sethi et al, 1993; Hakanson & Bergstrom, 1981).

Hence, the present study was carried out to evaluate the ionized serum calcium level in newborns who had undergone phototherapy.

Material and Methods:

The study was carried out in the Neonatal Intensive Care Unit (NICU) of the Department of Pediatrics, M.L.B. Medical College, Jhansi from February 2009 to April 2010 after taking approval from the institutional ethical committee. Study group included 30 neonates while 20 neonates served as a control. In the study group, 15 neonates were term (>37 weeks) and 15 neonates were preterm (>32 weeks and <37 weeks). Ten neonates each, acted as a control for the

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two groups of study subjects. The controls were fully matched with the study group with respect to age, sex, period of gestation and birth weight.

All the neonates included in the study group had hyperbilirubinemia which required management with phototherapy (AAP, 1994; Cashore, 2000).

Table I: Phototherapy in term neonates as per age (hours) and serum bilirubin level

Age	Consider phototherapy	Phototherapy
	(serum bilirubin level)	
24 hours	-	-
25-48 hours	>12 mg/dl	>15 mg/dl
49-72 hours	>15 mg/dl	>18 mg/dl
>72 hours	>17 mg/dl	>20 mg/dl

Table II: Phototherapy in preterm neonates as per weight and serum bilirubin level

Weight	Phototherapy (serum bilirubin level)
1000-1250 gm	8-10 mg/dl
1250-1500 gm	10-12 mg/dl
1500-2500 gm	15-18 mg/dl

Complete history and thorough physical examination was carried out in all the cases of study and control group. Besides routine investigation, ionized serum calcium and total serum bilirubin levels, before and after 48 hours of phototherapy were estimated. Total serum bilirubin was estimated by Malloy & Evelyn method using diazo reagent. Ionized serum calcium was determined by acid base analyzer machine (ABG machine, Roche Cobas b 121). A level of 0.9 to 1.1 mmol/L and 1.15 to 1.4 mmol/L were considered normal for preterm and term respectively (AAP, 1994).

The neonates in the control group were babies who had hyperbilirubinemia but were managed without phototherapy. Any neonate who had or developed a complication during the course of study i.e. birth asphyxia, respiratory distress, septicemia, infants of diabetic mother or any other high risk factor, were excluded from the study.

The neonates were clinically assessed for features of hypocalcemia i.e. jitteriness, irritability/ excitability, letharginess and convulsion, as well as other complication like rash, loose stool, fever and dehydration. Hypocalcemia in the neonate was managed with intravenous calcium; none of them required anticonvulsant drug.

The results were analyzed using paired and unpaired students *t* test.

Results:

In the study group, none of the term cases developed jaundice before first 24 hours of life; 20% of cases had onset of jaundice between 24 to 72 hours, while majority of cases (80%) had onset of jaundice after 72 hours. Whereas in control group, all the cases developed jaundice after 72 hours. In preterms of study group, 5 (33.3%) developed jaundice between 24 to 72 hours and 10 (66.66%) after 72 hours whereas 2 (20%) of control group developed jaundice between 24 to 72 hours and rest of the 8 (80%) cases after 72 hours (Table III).

All the cases of study group had serum bilirubin level (SBL) of more than 15 mg/dl whereas in control group none of the case had SBL more than 15 mg/dl (Table IV).

After exposure, there was no significant difference in serum calcium level in study and control group before phototherapy. After 48 hours of phototherapy in preterm neonates of the study group, there was significant fall in calcium level ($p<0.0001$). Similarly, in term neonates there was significant fall in serum calcium level after phototherapy ($p<0.005$;Table V).

In all, 12 (80%) of preterm neonates and 10 (66.6%) term neonates developed hypocalcemia after exposure to phototherapy. None of the neonates in control group developed hypocalcemia.

Of the 10 term neonates that developed hypocalcemia, 8 became symptomatic; 3 (30%) developed jitteriness, 2 (20%) developed irritability/excitability, 3 (30%) developed letharginess and none of the neonate developed convulsion. All the preterm neonates who developed hypocalcemia after exposure to phototherapy, became symptomatic; 6 (50%) developed jitteriness, 3 (25%) irritability/excitability, 3 (25%) letharginess and none of the neonate developed convulsions (Table VI).

Discussion:

The efficacy of phototherapy in prevention and treatment of hyperbilirubinemia in newborn infants has been well established. Romagnoli et al (1979) was the first to suggest the association of hypocalcaemia in the phototherapy in preterm newborn. Similarly, Hakanson & Bergstrom (1981) documented this observation in newborn rats. Gutcher & Odell (1983) observed

Table-III : Distribution of cases according to the age of onset of jaundice

Age of onset (hours)	Study group (n=30)		Control Group (n=20)	
	Term (n=15) (>37 weeks)	Preterm (n=15) (< 37 weeks)	Term (n=10) (>37 weeks)	Preterm (n=10) (< 37 weeks)
< 24	-	-	-	-
24-72	3 (20%)	5 (33.33%)	0	2 (20%)
>72	12 (80%)	10 (66.66%)	10 (100%)	8 (80%)

Table IV: Distribution of cases according to total serum bilirubin level and birth weight

Total serum bilirubin (mg/dl)	Study Group (weight)		Control Group (weight)	
	>2.5kg (Term) mean weight (2.72kg)	>1.5kg-2.5kg (Preterm) mean weight (2.23kg)	>2.5kg (Term) mean weight (2.76kg)	>1.5kg-2.5kg (Preterm) mean weight (2.09kg)
<10mg/dl	0	0	2 (20%)	3 (30%)
10-15mg/dl	0	0	8 (80%)	7 (70%)
>15mg/dl	15	15	0	0

Table V: Serum ionized calcium level (mmol/l) before & after 48 hours of phototherapy.

	Preterm ionized calcium level (mmol/l; mean ± SD)		Term ionized calcium level (mmol/l; mean ± SD)	
	Prestudy	Poststudy	Pretstudy	Poststudy
Cases	1.0387±0.6139	0.75±0.1367	1.196±0.0548	0.98±0.1426
Control	1.007±0.0458	098±0.0479	1.193±0.0380	1.77±0.0357
Significance	p=0.171	p<0001	p=0.81	p<005

Table VI : Distribution of cases according to symptoms in symptomatic hypocalcemic neonates.

Symptoms	Term	Preterm	Controls
Jitteriness	3	6	0
Irritability/ excitability	2	3	0
Lethargic	3	3	0
Convulsion	0	0	0

significant decrease in serum calcium level in newborn rats after exposure to fluorescent daylight.

Ionized calcium is crucial for many biochemical processes including blood coagulation, neuromuscular excitability, cell membrane integrity and function and cellular enzymatic and secretory activity.

Hypocalcaemia increases cellular permeability to sodium ions and increased cell membrane excitability. The signs are usually non-specific like apnea, seizure, jitterness, increased extensor tone, clonus, hyperreflexia, and stridor (Laryngospasm).

Sethi et al (1990) has studied the effects of phototherapy in 20 term & 20 preterm hyperblirubinemic neonates. They observed that 75% of term & 90% of preterm neonates developed hypocalcaemia after phototherapy. Similarly, Medhat (2006) of Cairo University observed that 75% of term & 90% of preterm developed hypocalcaemia after phototherapy. Observation of the present study are in agreement with the above studies.

Jain et al (1998) also observed hypocalcaemic effect of phototherapy, in 30% term and 55% preterm neonates, which is much lower than the above mentioned studies.

Hunter (2004) hypothesized that phototherapy inhibits pineal secretion of melatonin which blocks the effect of cortisol on bone calcium. Cortisol unchecked exerts a direct hypocalcemic effect and increases bone uptake of calcium as well.

Neonates requiring phototherapy are at a higher risk of developing hypocalcemia. Therefore, it is

suggested that newborn requiring phototherapy administration of calcium may be considered in them.

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Research Article

Fenofibrate: A novel approach in treating uncomplicated neonatal hyperbilirubinemia?

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Abstract:

Fenofibrate is one of the commonest drug to treat hyperlipidemia in adults (Marshall et al, 2011). However, apart from its hypolipidemic action, it also has the ability to induce bilirubin conjugation. The present study was aimed to find its effect on uncomplicated neonatal hyperbilirubinemia. The study was conducted on 40 normal term newborns who were admitted for uncomplicated jaundice at R.D. Gardi Medical College & Hospital, Ujjain from March 2010 to October 2010. The data included: age, sex, weight, serum bilirubin level, and duration of hospitalization. All newborns enrolled in this study, received phototherapy. The cases were divided into two groups viz. Fenofibrate group (B) consisting of 14 boys (70%) and 6 girls (30%) and a control group (A) with 11boys (55%) and 9 girls (45%). There were no statistical overt differences between the two groups regarding sex distribution, age, weight and total serum bilirubin level at the time of admission. Mean values for total serum bilirubin in Fenofibrate group at 12, 24, 36, and 48 hours after starting of phototherapy were significantly lower than those for control group (p<0.00l). The mean time needed for phototherapy was also shorter in Group B than Group A. Fenofibrate appears to be an effective drug for neonatal hyperbilirubinemia. This decreases the duration of phototherapy and thus reduces the length of hospital stay.

Key Words: Fenofibrate, Serum Bilirubin, Neonates, Physiological Jaundice.

Introduction:

Destruction of R.B.C. and its haem component produces bilirubin which is then conjugated to a soluble form and excreted. In neonates, this becomes all the more significant because of high Red Cell mass and relative immaturity for bilirubin conjugation (Maisels & Kring, 2006). This free bilirubin deposits in the skin and mucous membranes and produces jaundice. It may also deposit in the brain where it has been implicated in causing transient dysfunction and, occasionally, permanent neuronal damage (Newman et al, 2006). ''Kernicterus'' refers to neurological consequences of the deposition of unconjugated bilirubin in brain tissue by damaging and scarring of the basal ganglia and brain stem nuclei (American Academy of Pediatrics, 2004). Clinicians usually suffer from "Vigintiphobia" i.e. a bilirubin level of more than 20mg/dl where there may be a high probability of development of ''Kernicterus'' (Harris & Roth, 1989).

There are several non pharmacological and pharmacological modalities for treating hyper-bilirubinemia. Phototherapy has emerged as the most widely used non pharmacological therapy for the treatment and prophylaxis of neonatal unconjugated hyperbilirubinemia, but it has several untoward complications such as deleterious effect to eyes, high temperature, loose stool and bronze baby syndrome (Piazza & Stoll, 2008). Pharmacological agents introduced for treatment of unconjugated neonatal jaundice include Phenobarbitone (Sterm et al, 1970), Metalloporphyrins and D–penicillamine (Piazza & Stoll, 2008) but, so far they have not been proved very effective and safe in clinical use (Dennery et al, 2002).

Fibrates have been used for several years as a hypolipidemic drug (Bennet & Brown, 2008). Fibrates also increase bilirubin conjugation and excretion via induction of glucuronyl transferase activity (Kutz et al, 1984). Its potency to induce bilirubin conjugation is many times more than Phenobarbitone (Gabilan et al, 1990). The effect of Clofibrate on uncomplicated hyperbilirubinemia was proposed in some studies (Bourget et al, 1995; Mohammadzadeh et al, 2005).

Mohammadzadeh et al (2005) studied Clofibrate effect on reducing serum bilirubin level of neonates beyond the first week of life. Clofibrate, however, is no longer routinely used for hyperlipidemia in adults due to its adverse effect profile. Fenofibrate is now the most widely used fibrate in treating

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hyperlipidemia and has a comparatively much better safety profile than clofibrate (Scott et al, 2009). The present study was designed to assess the effect of Fenofibrate on uncomplicated hyperbilirubinemia of neonates during the first week of life.

Material and Methods:

This study was under taken from March 2010 to October 2010, at R.D. Gardi Medical College & Hospital, Ujjain (M.P.). Ethical committee approval was taken vide no. 68 dated 05/02/2010.

A total of 40 neonates were enrolled in this study after excluding jaundiced newborns presenting with infection, ABO or Rh incompatibility, G6PD deficiency, conjugated bilirubin above 2 mg/dl or exceeding 15% of total serum bilirubin (TSB) and congenital anomalies. All selected neonates were born at term (with gestational age of 38 to 41 weeks), breastfed, had total serum bilirubin (TSB) levels between 15 to 21.7 mg/dl and body weight between 2500gm to 3500gm.

These neonates were randomly allocated to the control group (A) and Fenofibrate group (B) with the permission of their parents and the ethical committee of hospital. Both groups received phototherapy under standard conditions with 4 special white 420-480 nanometer lamps, adjusted to about 30 centimeters above the neonate. Group B received a single oral dose of 10 mg/kg of nonmicronized Fenofibrate.

Blood samples were withdrawn immediately after admission and before starting any treatment from both the groups for laboratory tests such as complete blood count (CBC), total bilirubin (direct and indirect), reticulocyte count, Coomb's test, G6PD assay and blood group (ABO and Rh of neonates and their mothers). Total serum bilirubin and indirect bilirubin were measured every 12 hours till the end of phototherapy. Statistical analysis of data was performed by unpaired *t* test and paired *t* test.

Results:

All the 40 newborns enrolled in the present study received phototherapy which included 14 boys (70%) and 6 girls (30%); in the Fenofibrate group, and rest of them were included in the control group with 11 boys (55%) and 9 girls (45%). There was no statistical overt difference between the two groups regarding sex, age, weight and Total serum bilirubin at the time of admission (Table I).

Table I: Age,Weight and total serum bilirubin in two group with neonatal hyperbilirubinemia.

Parameter	Control Group (A)	Fenofibrate Group (B)	*t* value	*p* value
Mean Age (Day)	4.60 ± 0.27	5.15±0.22	-1.59	0.12
Mean Weight (gm)	2857 ± 0.045	2808±0.051	0.73	0.47
Mean Total Serum Bilirubin (mg/dl)	19.06 ± 0.26	19.25±0.30	0.47	0.64

There was no persistent hyperbilirubinemia. The mean values for TSB at 24th, 36th and 48th hours after admission in group B were significantly less than group A (Table II).

All neonates in group B, after 48 hours of starting the treatment did not need phototherapy (Fig. I). But in group A, 9 out of 20 neonates needed it for 72 hours and 4 neonates for 96 hours. During hospitalization, and 48 hours after discharge, none of the neonate demonstrated any complication. All neonates were followed for a period of a month, and no complication was found in them.

Table II: Plasma bilirubin values during treatment in control and Fenofibrate group.

Time (Hours)	Control Group (A) Plasma Bilirubin (mg/dl)	Fenofibrate Group (B) Plasma Bilirubin (mg/dl)	*t* value	*p* value
0	19.06±0.26	19.25±0.30	0.47	0.64
12th	18.81±0.24	18.55±0.27	0.73	0.47
24th	18.33±0.23	17.32±0.25*	2.98	0.005
36th	17.75±0.23	15.88±0.27*	5.32	<0.001
48th	16.82±0.22	14.45±0.23*	7.33	<0.001

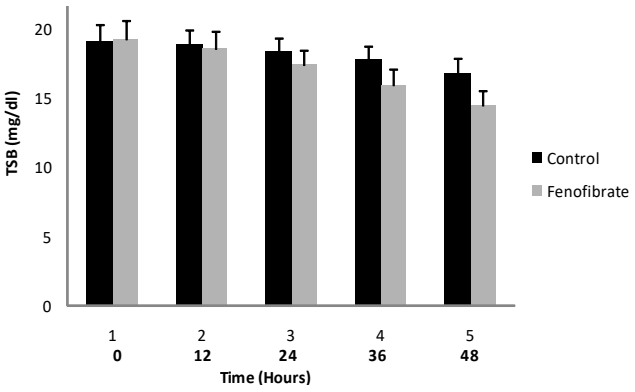

Fig. I: Plasma bilirubin values during treatment in control and fenofibrate group.

Discussion:

In the present study, the effect of combination therapy of single oral dose of Fenofibrate (10mg/kg)

and phototherapy (Group B) was compared with phototherapy alone (Group A) on TSB level.

Total serum bilirubin levels in group B at 24th, 36th and 48th hours after starting the treatment were significantly lower than those in group A. The mean time of phototherapy needed in group B was also lower than that in group A.

For uncomplicated unconjugated hyperbilirubinemia, phototherapy if unsuccessful, exchange transfusion remains the primary treatment modality to keep the total serum bilirubin level below the pathological levels (Piazza & Stoll, 2008). Intravenous immunoglobulin and metalloporphyrins are sometimes used prophylactically in cases of hyperbilirubinemia due to isoimmune haemolytic disease (Gottstein & Cooke, 2003; Kappas et al, 2001).

Although, unconjugated hyperbilirubinemia is a common neonatal problem, so far, very few drugs have been found to be effective in its treatment. Some of these drugs such as Phenobarbitone act by induction of the conjugation of bilirubin which makes the bilirubin soluble and thus fit for renal excretion. But, Phenobarbitone takes days to influence the enzyme and may produce sleepiness, sluggishness and feeding difficulty. It may also depress the respiratory centre. Compared to Phenobarbitone, Fibrates induce bilirubin conjugation much more effectively and readily converts unconjugated bilirubin to conjugated bilirubin, thus, hasten its clearance. Some studies have shown effectiveness of Clofibrate in treatment and prophylaxis of hyperbilirubinemia of infancy at a dose of >100 mg/kg (Mohammadzadeh et al, 2005). Finofibrate is very similar to clofibrate in its mechanism of action. It is easily available, has a relatively much better safety profile and thus much safer to administer in pediatric age group than Clofibrate. Fenofibrate has some side effects in adults after prolonged use, such as gastrointestinal symptoms and muscle cramp (Bennet & Brown, 2008); in the neonatal period with a single dose of Fenofibrate, no side effects were observed in this study. No side effect in the patients was observed up to one month of follow up.

Conclusion:

The present study clearly shows that Fenofibrate decreases the time needed for phototherapy and lessens the duration of hospital stay. Thus, Fenofibrate appears to be an effective and probably safe drug for uncomplicated neonatal hyperbilirubinemia. Although, no side effects of Fenofibrates were observed after a single dose, further studies with a more precise and longer follow up is needed for proving its safety to be used in the treatment of neonatal hyperbilirubinemia.

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Research Article

Pulmonary Functions in Trained and Untrained Wind Instrument Blowers

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Abstract:

The present cross-sectional study was designed to ascertain whether regular and trained wind instrument blowers develop higher pulmonary functions than untrained or part time blowers.

The study included 155 trained & regular blowers (Group A), 100 untrained part-time blowers (Group B) and 100 non-blowers (Group C). They were investigated by a computerized spirometer (RMS medspiror).

Group A subjects showed a significantly higher (p<0.001) percentage predicted value for Forced Vital capacity (FVC), Forced expiratory volume in the 1st second (FEV_1), Peak Expiratory Flow Rate (PEFR), Maximum Voluntary Ventilation (MVV), Forced Expiratory Flow at 25% & 50% of FVC (FEF25% & FEF50%), Forced Expiratory Flow between 25% & 75% of FVC (FEF 25-75%), FEF50% of FVC, than the other two groups. However, FEV_1/FVC % in group A was not statistically higher than the other two groups (p=0.3699). Thus, regular training of wind instrument blowing increases the pulmonary functions which may be a physiological advantage of blowing.

Key Words: Wind Instrument, Pulmonary function test, Physiological effects.

Introduction:

Few studies conducted on wind instrumentalists have concluded that the wind instrument blowers have higher pulmonary functions (PFT) due to increased respiratory muscle strength, most probably the consequence of regular ventilatory muscle training (Fiz et al, 1993; Munn et al, 1990).

The study conducted by Bouhuy (1964) revealed higher vital capacity in brass players than the non-blowers. Barbenel et al (1988) showed that mouth pressure got increased with the increase in loudness in trumpet blowers as compared with the non-blowers. In similar study in trumpeters, Fiz et al (1993) found higher maximum inspiratory pressure (PImax) and maximum expiratory pressure (PEmax). Kahane et al (2006), concluded that the bassoon players had higher subglottic pressure during prolonged expiratory blowing activity. Cossette (2002) and Cossette et al (2008) showed that flute blowers developed higher mouth pressure during high intensity blowing and also observed that flautists used 72-83% of their vital capacity during flute blowing. Schorr-Lesnick et al (1985) found higher percentage predicted FVC in singers than the non-blowers i.e string and percussion instrumentalists.

The study conducted in similar occupation i.e. glass blowers by Zuskin et al (1993) revealed that glassblowers showed a significant increased forced vital capacity (FVC), forced expiratory volume in 1st second of FVC (FEV_1) and the maximum flow rates at 25% and 50% of FVC (FEF25% and FEF50%) as compared to non-blower controls. In all of the above studies, blowers were compared with the non- blowers, but there were no comparison between the trained and untrained blowers.

The present study was conducted to determine the effect of blowing the wind instrument by trained, untrained and non blowers on PFT.

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Material and Methods:

The present cross sectional study included 355 male non-smoker normal subjects of age ranging between 20 to 50 years; out of which 155 were regular trained blowers currently employed in a performing role (Group A), 100 untrained part-time blowers who performed blowing only on occasions (Group B) and 100 non-blowers (Group C).

After obtaining the approval from the institutional ethical committee, we conducted the study at military music training center, Pachmarhi (M.P), various local band party centers at Nagpur & N.K.P Salve Medical College & Hospital, Nagpur (Maharastra).

Smokers and those suffering from any prevailing illness were excluded from the study. For purpose of study, a smoker was defined as a regular cigarette, cigar, bidi or pipe smoker up to a month prior

to testing while a non-smoker was either an ex-smoker (ceased smoking for more than a month ago) or had smoked less than 1 cigarette or bidi per day in one year or 1 cigar per week in one year (Blackburn et al, 1959). Prevailing illness included any recent viral infection (within 2-3 weeks) or other acute illness (especially that involved the respiratory tract) and a serious illness such as recent myocardial infarction, pulmonary emboli, moderate to severe ascitis (Ferris, 1978).

The pulmonary function tests were performed by Medspiror, an automated, computerized flow sensing turbine type of Spirometer with an internal correction of volume with body temperature and pressure saturated (BTPS). All the subjects were made familiar with the procedure. The baseline data that is name, age, height, weight, body mass index, years of blowing, date of performing the test and atmospheric temperature was fed to the computerized medspiror. The test was performed in sitting position (Pierson et al, 1976). The parameters like FVC: Forced vital capacity, FEV1: Forced expiratory volume in 1 second, FEV1/FVC %: ratio of FEV1/FVC in %, FEF-25%: Forced expiratory flow of 25% of FVC, FEF-50%: Forced expiratory flow of 25% of FVC, FEF-75%: Forced expiratory flow of 75% of FVC, FEF25-75%: Forced expiratory flow between 25% & 75% of FVC, PEFR: Peak Expiratory flow rate, MVV: Maximum voluntary ventilation were recorded three times & the best of the three was noted. The percentage predicted values rather than the actual values were used for analyzing the data. The data was analyzed by using ANOVA one way for all the parameters except 'period of blowing' where unpaired *t* test was applied.

Results:

Out of 355 enrolled subjects, there were 255 trained and untrained blowers put together. Out of 255 blowers, 58 were trumpet blowers, 56 clarinet blowers, 36 euphonium blowers, 30 bag pipers, 23 cornet blowers, 17 saxophone blowers, 11 trombone blowers, 8 bugle blowers, 4 flutist, 3 each were French-horn blowers oboe blowers and bass blowers; 2 were sousaphone blowers and 1 was bassoon blower.

Table I: Age distribution of subjects in all the 3 groups.

Age in Years	Group A (n = 155)	Group B (n = 100)	Group C (n =100)
20 – 30	61 (39)	32 (32%)	38 (38 %)
31 – 40	62 (40%)	43 (43%)	40 (40%)
41 – 50	32 (21%)	25 (25 %)	22 (22%)

Age wise distribution of subjects is depicted in Table I. When overall age distribution in three groups was analyzed, it was observed that the mean age of Group B (35.5 yrs) was more than Group A (33.16 yrs.) and Group C (33.65 yrs). However, it was not statistically significant (p=0.0536). Basal metabolic index (BMI) was comparable in the three groups and the difference was not statically significant (p=0.3916). The mean period of blowing in years was more in Group B (14.08 yrs) than Group A (12.23 yrs), but the difference was not significant (*p*=0.0552; Table II).

Table II: Mean age, BMI and period of blowing in various groups.

Baseline Parameters	Group A (n = 155)	Group B (n =100)	Group C (n =100)	*p* value
Age (years)	33.16 ± 6.77	35.5 ± 7.74	33.65 ± 8.14	*p*=0.0536 NS
BMI (Kg/m2)	22.63 ± 2.17	22.44 ± 2.82	22.21 ± 2.18	*p*=0.3916 NS
Period of blowing in years	12.23± 7.23	14.08 ± 7.78	-	*p*=0.0552 NS

The mean predicted value of FVC, FEF25-75%, PEFR, FEF 50%, FEF 75% and MVV was significantly higher (*p*<0.001) in regular trained wind instrument blowers (Group A) than in Group B & C. However, when FEV1/ FVC% and FEF 25%, were considered no statistical difference was found in regular trained blowers and untrained non blowers (Table III).

Discussion:

The voluntary breath control is essential for playing wind instruments and the wind instrumentalists undergo continuous ventilatory muscle training (Fiz et al, 1993; Schorr-Lesnick et al, 1985). Training of ventilatory muscles follows the basic principle of training any striated muscle with regards to specificity, intensity and duration of training (Kisner & Colby, 2007; Kreuter et al, 2008, Wang et al, 2002).

Our findings of higher FVC and FEV1 values and slightly reduced FEV1/FVC value in trained blowers were supported by the study conducted by Schorr-Lesnick et al (1985) on brass wind instrument players where the percentage predicted FVC value (98.7 ± 13.1) and FEV1(103.5 ± 15.5) were higher in the blowers than the non-blowers (FVC=97.2 ± 13.8

Table III. Spirometric parameters in all the groups

Spirometric Parameters	Group A (n = 155)	Group B (n =100)	Group C (n =100)	*p* value
	Mean ± SD	Mean ± SD	Mean ± SD	
FVC (lits)	108.66 ± 12.17	104.17 ± 13.03	98.2 ± 10.87	<0.001 *
FEV1 (lits)	110.34 ± 11.48	105.89 ± 11.53	100.6 ± 10.92	<0.001*
FEV1/FVC%	101.74 ± 4.95	102.03 ± 4.75	102.59 ± 4.16	0.3699 NS
FEF 25-75% (lits)	84.60 ± 17.8	73.55 ± 9.08	71.49 ± 7.45	<0.001 *
PEFR (lits)	104.61 ± 12.7	67.6 ± 10.04	67.56 ± 10.49	<0.001 *
FEF 25% (lits)	96.20 ± 16.81	69.45 ± 8.65	67.56 ± 8.42	0.1057 NS
FEF 50% (lits)	73.83 ± 17.52	62.02 ± 9.19	60.3 ± 7.45	<0.001 *
FEF 75 % (lits)	53.29 ±13.35	51.65 ± 8.83	50.42 ± 7.29	<0.001*
MVV (l/m)	109.53 ± 12.69	79.93 ± 10.09	76.08 ± 9.91	<0.001 *

and FEV1=101.9 ± 17.6). Similarly in the blowers, the percentage predicted FEV1/FVC (78.0 ± 6.8) value was slightly less than the non-blowers FEV1/FVC (79.1 ± 9.4). Likewise, in the blowers percentage predicted MVV (118.2 ± 22.2) was higher than the non-blowers MVV (112.5 ± 25.2).

The studies conducted in a similar occupation i.e. glass blowers, by Munn et al (1990) and Navratil & Rejsek (1968) also supported our results of FVC, FEV_1 & FEV_1/FVC. In their study, the percentage predicted FVC and FEV1 were significantly more in full time glass blowers than part time blowers, and non-glass blowers.

Munn et al (1990) also showed higher percentage predicted mid expiratory flow (MEF), FEF 25-75% and MVV than part-time blowers and the non-blowers.

According to the hypothesis given by Schorr-Lesnick et al (1985), the musicians have exceptional pulmonary functions, a physiological advantage due to the respiratory muscle training. We also found higher pulmonary functions in our trained blowers. An explanation for higher FVC values in our trained wind instrument blowers might be due to their regular breathing pattern of using the whole vital capacity skillfully during the play with deep inspiration followed by prolonged expiration through the instrument. The greater FEV_1, FEF25-75%, FEF25 %, 50% & 75% and PEFR might be due to higher FVC in trained blowers. The low value of FEV_1/FVC in trained blowers than the other two groups might probably be due to greater FVC. The greater MVV in trained blowers could be due to the increased respiratory muscle strength, probably the result of regular ventilatory muscle training (Bouhuys, 1964; Munn et al, 1990; Fiz et al, 1993; Fletcher, 2000; Kreuter et al, 2008).

Other factors that were thought to influence the results included the motivation of the trained blowers and their regular physical (military) training. It would seem that our trained blowers may be motivated more by the traditionally adapted blowing maneuvers in military, related to an ability which the trained military blowers played in high regards. The physical military training in addition, might also cause strengthening of the respiratory muscles (Huang & Li, 1993).

It could be concluded that the trained wind instrument blowers had higher pulmonary functions than the untrained blowers and the non-blowers, which might be a physiological advantage due to regular training of blowing. The untrained blowers if blow regularly, can adapt proper blowing techniques.

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Research Article

Morphological Spectrum of Endometrium in Patients Presenting with Dysfunctional Uterine Bleeding

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Abstract:

Dysfunctional uterine bleeding (DUB) is a clinical term used to describe bleeding not attributable to any underlying organic pathological condition.

A total of 187 patients were included in the present study which were categorized in reproductive (<40 yrs), perimenopausal (40-50yrs) and postmenopausal (>50yrs) age groups. One hundred sixteen cases (62%) were in reproductive age group, 47 cases (25.1%) in perimenopausal age group and 24 cases (12.8%) in postmenopausal age group. Histopathological examination of dilatation and curettage (D&C) samples was done to elucidate the cause of DUB.

In reproductive age group, proliferative endometrium was the most common finding (26.8%) followed by irregular maturation (25%).Complex hyperplasia was seen in 6 cases, out of which 1 case showed atypia. Nineteen cases (16.4%) showed associated endometritis. No case of malignancy was observed in this group.

In perimenopausal age group, simple hyperplasia was the most frequent finding (29.8%).Complex hyperplasia was seen in 3 cases, out of which 1 revealed atypia. Three cases of malignancy (6.4%) were reported.

In postmenopausal age group, most frequent finding in DUB was complex hyperplasia seen in 8 cases (33.3%), out of which 2 cases showed atypia. Six cases (25%) of simple hyperplasia and 4 cases (16.7%) of malignancy were reported. Atrophic endometrium was observed in D&C samples from 6 patients (25%).

Key Words: Dysfunctional uterine bleeding, hyperplasia,endometritis, adenocarcinoma.

Introduction:

Normal menstruation is defined as bleeding from secretory endometrium associated with ovulatory cycles, not exceeding a length of five days. Any bleeding not fulfilling these criteria is referred to as abnormal uterine bleeding (Rosai, 2005). Abnormal uterine bleeding is considered one of the most common and challenging problems presenting to the gynecologist. It is responsible for as many as one-third of all outpatient gynecologic visits (Awwad et al 1993, Wren, 1998). It can be caused by a wide variety of systemic diseases,endocrine disorders or drugs. On the other hand, it may be related to pregnancy, anovulation, fibroids, polyps,adenomyosis or neoplasia (ACOG Practice Bulletin, 2001). Dysfunctional uterine bleeding (DUB) is a diagnosis of exclusion. Dysfunctional uterine bleeding may represent a normal physiological state or can be sign of a serious underlying condition. Dysfunctional uterine bleeding may be the symptom of endometrial carcinoma in 8-50% of cases (Dangal, 2003). The present study was carried out to evaluate the histomorphological spectrum in endometrial samples in patients clinically labelled as DUB.

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Material and Methods:

The present study was conducted in the Department of Pathology, Subharti Medical College, Meerut. A total of 187 patients clinically diagnosed as DUB were included in this study over a period of 2 yrs.Retrospective analysis of Hematoxylin and Eosin(H&E) stained slides of D & C tissue was done under light microscopy.Patients were categorized into reproductive (<40 yrs), perimenopausal (40-50yrs) and postmenopausal (>50yrs) age groups. Histopathological diagnosis was made, recorded and further categorization was done for all cases.This study was approved by Ethical Committee.

Results:

Out of 187 cases, 116 cases (62%) were in reproductive age group, 47 cases (25.1%) were of perimenopausal group and 24 cases (12.9%) belonged to the postmenopausal group (Fig. I). For all cases clinically diagnosed as DUB, histopathological examination was done and findings were noted.

In reproductive age group, proliferative endometrium was the most common finding observed

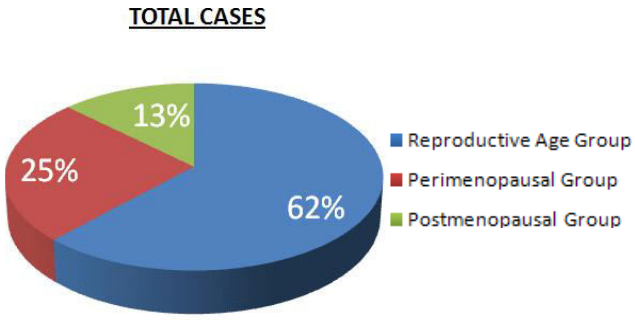

Fig. I Pie Diagram showing age group distribution in total cases

in 31 cases (26.8%) followed by irregular maturation in 29 cases (25%). Complex hyperplasia was present in 6 cases, out of which 1 case showed atypia. Endometritis was seen in 19 cases (16.4%). No case of malignancy was reported in this group.(Table I).

In perimenopausal age group,simple hyperplasia (Fig. II) was the most frequent finding seen

Table I: Endometrial pattern in reproductive age group.

Reproductive Age Group	No. of Patients	Percentage
Proliferative endometrium	31	26.8
Irregular maturation	29	25
Simple hyperplasia	24	20.7
Endometritis	19	16.4
Complex hyperplasia without atypia	5	4.3
Progesterone effect	5	4.3
No interpretation (Scanty material)	2	1.7
Complex hyperplasia with atypia	1	0.8
Malignancy	0	0

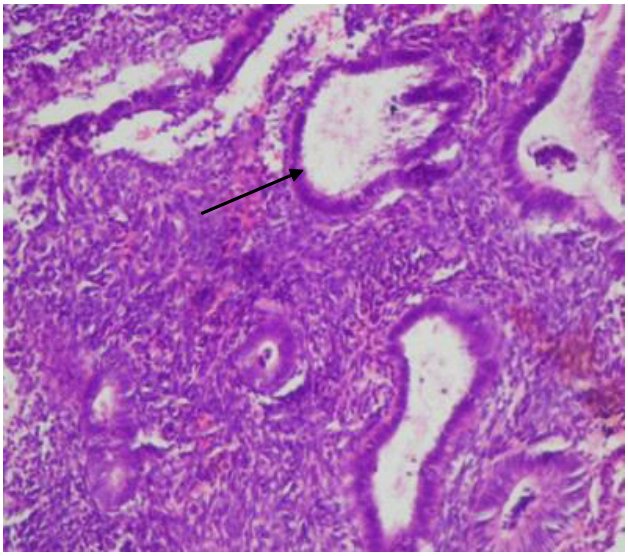

Fig. II: Photomicrograph of simple hyperplasia showing dilatation of glands (H&E stain, 100X).

in 14 cases (29.8%) followed by proliferative endometrium and irregular maturation which were present in 10 (21.2%) and 8 (17%) cases respectively. Complex hyperplasia was present in 3 cases, out of which 1 revealed atypia. Three cases (6.4%) of malignancy were also observed (Table II).

In postmenopausal age group, most frequent finding was complex hyperplasia, seen in 8 cases (33.3%), out of which 2 cases showed atypia. Six cases (25%) were of simple hyperplasia (Fig. II) and 4 cases (16.7%) of malignancy were observed. All cases of malignancy were reported as endometrial adenocarcinoma. Remaining 6 cases revealed atrophic endometrium (Fig. III; Table III).

Table II: Endometrial pattern in perimenopausal age group

Perimenopausal group	No. of Patients	Percentage
Simple hyperplasia	14	29.8
Proliferative endometrium	10	21.2
Irregular maturation	8	17
Progesterone effect	4	8.5
Endometritis	3	6.4
Malignancy	3	6.4
Complex Hyperplasia without atypia	2	4.3
No interpretation (Scanty Material)	2	4.3
Complex hyperplasia with atypia	1	2.1

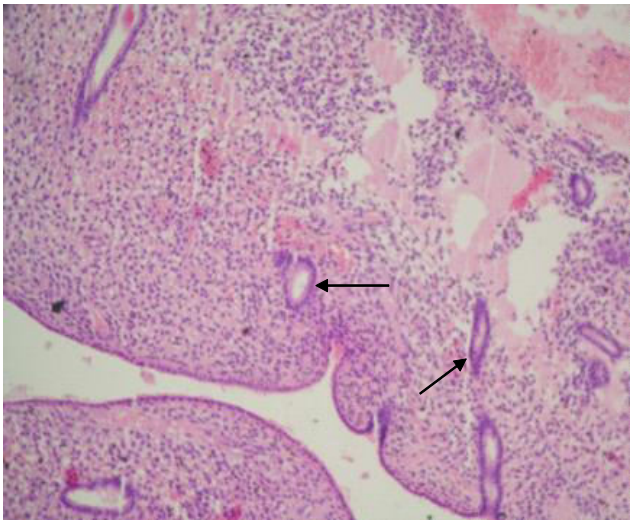

Fig. III: Photomicrograph of atrophic endometrium showing small tubular glands (H&E stain, 100X).

Discussion:

In normal cycles, menstrual shedding is followed by endometrial proliferation under estrogenic stimulation. During this phase, the endometrial glands

Table III: Endometrial pattern in post menopausal group.

Postmenopausal Group	No. of Patients	Percentage
Complex hyperplasia without atypia	6	25
Complex hyperplasia with atypia	2	8.3
Simple hyperplasia	6	25
Malignancy	4	16.7
Atrophic endometrium	6	25

grow and become tortuous. (Deligdisch, 2000) The secretory activity in the second half of the menstrual cycle is characterized by endothelial proliferation, thickening of the wall and coiling, forming the spiral arterioles on the ninth postovulatory day. (Deligdish, 2000; Mutter & Ferenczy, 2004). Excessive and irregular uterine bleeding (abnormal uterine bleeding) continues to be one of the most frequently encountered complaint in Gynecology. The frequency of the various causes of abnormal uterine bleeding varies with the age of the patient. Dysfunctional uterine bleeding is a diagnosis of exclusion in which no specific organic cause can be attributed to as the reason for the bleeding. It is more common in early and late years of reproductive life.(Rosai, 2005).In most instances dysfunctional bleeding is due to the occurence of an anovulatory cycle.These cycles are most common at menarche and in perimenopausal period (Crum, 2010)

The classification system used by the World Health Organization (WHO) designates four different types of hyperplasias with varying malignant potential. Hyperplasias are classified as simple or complex based on the absence or presence of architectural abnormalities such as glandular complexity and crowding. Hyperplasias are further designated as atypical if they demonstrate nuclear atypia (Rosai, 2005).

Gredmark et al (1995) studied D&C specimens of 457 postmenopausal women and showed atrophy in 50% of cases, varying degrees of hyperplasia in 10 % and adenocarcinoma in 8% cases. In our study, the most common finding in postmenopausal women was complex hyperplasia in 8 cases (33.3%) out of which 2 cases showed atypia while malignancy was seen in 4 cases (16.7%). Atrophic endometrium and simple hyperplasia were other frequent causes. This discrepancy might be due to small sample size of the present study.

Dangal (2003) studied 84 patients of more than 45 years of age who presented with DUB. Out of these 84 patients, 45 were in postmenopusal age group and 39 were in perimenopausal age group. Findings noted in perimenopausal women were proliferative endometrium in 15 cases (38.5%), secretory endometrium and endometrial hyperplasia in 9 cases (23%) each, endocervical carcinoma and endometrial adenofibroma in 3 cases each (7.7%) while in the present study, simple hyperplasia was the most frequent finding (29.8%) followed by proliferative endometrium (21.2%) in the perimenopausal age group.It might be because in this age group , menstrual cycles often become irregular due to decreased number of follicles and their increased resistance to gonadotropic stimulation, resulting in low level of estrogen, which cannot keep the normal endometrium growing. Amongst the postmenopausal group, atrophic endometrium was the most common finding seen in 29 cases (64.4%) followed by endometrial carcinoma in 8 cases (17.7%), endometritis in 5 cases (11.1%) and endocervical cancer in 3 cases (6.6%), but in the present study, most common finding in postmenopausal women was complex hyperplasia in 8 cases (33.3%) followed by simple hyperplasia and atrophic endometrium in 25% of cases.

Muzaffar et al (2005) studied endometrial curettings in 260 patients with DUB. Forty eight percent patients were seen in the age group of 41-50 yrs. Most common lesions seen were endometrial hyperplasia (24.7%) followed by chronic non-specific endometritis (13%). In the present study, most cases were in the reproductive age group and proliferative endometrium (26.8%) was the most common finding followed by irregular maturation (25%). Irregular maturation means regularly recurring menorrhagia in which bleeding phase of the cycle requires 7 days or more for completion,without subsequent prolongation of the cycle. This is due to lag in shedding of the secretory endometrium, which is normally completed by the fourth day of menstruation (Rosai, 2005).

Abdullah & Bondagji (2011) analysed 2295 endometrial samples from women presenting with abnormal uterine bleeding from January 1995 to June 2008 and noted that commonest histopathological diagnosis was secretory endometrium in 571 (24.9%)cases,followed by proliferative endometrium in 498 (21.7%), endometrial polyp in 227 (9.9%),disordered proliferative endometrium in 200 (8.7%), simple cystic hyperplasia in 160 (7%), chronic endometritis in 134 (5.8%), inactive endometrium in 126 (5.5%), atrophic endometrium in 70 (3.1%), uterine

malignancies in 41 (1.8%), complex hyperplasia without atypia in 33 (1.4%) and finally complex hyperplasia with atypia in 15 (0.7%) cases. Two hundred twenty (9.6%) samples did not contain endometrial tissue and were considered insufficient for diagnosis. Uterine malignancies and complex hyperplasia with atypia were more common in the age group of 52 years and older, and were seen in 3.3% and 1.2% respectively.

Baral & Pudasaini (2011) analysed D& C specimens of 300 women and concluded that in patients less than 40 years of age, most frequent finding was normal endometrium(50%) In the age group between 40-55 years, abnormal physiological changes (32%) and in patients above 55 years, malignancy were most common observations. There were 36% unsatisfactory samples in postmenopausal (above 55) age group.

Conclusion:

Histopathological examination of D& C tissue in patients of abnormal uterine bleeding shows a wide spectrum of changes ranging from normal endometrium to malignancy, however, frequency of cause varies with age. In the present study, the most frequent finding seen in patients with DUB in reproductive age group was proliferative endometrium.In perimenopausal age group simple hyperplasia was most frequently noted, while in the postmenopausal age group complex hyperplasia was the predominant finding.

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Research Article

Feasibility of Laparoscopic Cholecystectomy Under Spinal Anaesthesia

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Abstract:

Laparoscopic Cholecystectomy (LC) has been conventionally done under general anaesthesia (GA). Regional anaesthesia is usually preferred in patients where GA is contraindicated. In this study, we present experience of using spinal anaesthesia (SA) for LC with the contention that it is a good alternative to GA. Spinal anaesthesia was used in 134 patients in whom LC was planned.

There was no modification in the technique, and the intra abdominal pressure was kept at 8mm Hg to 12 mm Hg. Sedation was given if required, and conversion to GA was done in patients not responding to sedation or due to failure of SA. Results were compared with 100 patients who had undergone LC under GA.

Out of 134 patients, two patients required conversion to GA. Hypotension requiring support was recorded in 28 (20.89%) patients, and 32 (23.88%) experienced neck or shoulder pain, or both. Postoperatively, 2.9% (4) of patients had vomiting as compared to 33% (33) of patients who were administered GA. Injectable diclofenac was required in 36.56% (49) for abdominal pain within 2 hours postoperatively and oral analgesic was required in 106 (79.10%) patients within the first 24 hours in SA group. However, 96% of patients operated under GA required injectable analgesics in the immediate postoperative period. Postural headache was experienced by 8 (5.9%) patients postoperatively. Average time of discharge was 1.9 days in patients operated under SA.

Key Words: Laparoscopic cholecystectomy, Spinal anaesthesia.

Introduction:

Conventionally General anaesthesia (GA) remains the choice for the majority of open abdominal surgical procedures, and regional anaesthesia is preferred only for patients who are at high risk under GA. The main reason for selecting spinal anaesthesia (SA) as the first choice for laparoscopic cases was its advantages over GA which include uniform total muscle relaxation, a conscious patient, economical, relatively uneventful recovery, pain free early postoperative period and the protection from potential complications of GA (Casey, 2000). It was thus a logical extension that we shifted to SA for all Laparoscopic Cholecystectomy (LC) cases. The world literature until about a decade ago, suggested GA as the only anaesthetic option for abdominal laparoscopic surgery, and it is only recently that reports of laparoscopic surgery being performed in select patients under spinal or epidural anaesthesia have started to appear (Sinha et al, 2008).

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Material and Methods:

This retrospective study was carried out at Subharti Medical College, Meerut from June 2006 to July 2009. The American Society of Anaesthesiologists (ASA) Grade l & 11 patients undergoing laparoscopic abdominal procedures were offered SA as the first choice. Since 2006, 134 patients have undergone abdominal laparoscopic cholecystectomy under SA. Patients who preferred GA or had contraindications for SA, like children less than 10 years of age, spinal deformity, cardiac problems and skin pathology overlying the SA site, were operated under GA and were taken as controls. In the study group, 26 had acute cholecystitis and had to be taken for emergency LC whereas, 105 underwent elective cholecystectomy. Pre-operatively, preloading with 1000 ml Ringer Lactate was done, and patients were pre-medicated 45 minutes before surgery with inj. Ranitidine 50mg intravenously and lnj. Metoclopramide 10mg intramuscularly. Spinal anaesthesia was administered using a 25FG lumbar puncture needle in LI-L2 intervertebral space. Three millilitre of Heavy Bupivacaine mixed with 25 microgram Fentanyl was used. Head down tilt to 20 degrees was kept for 10 minutes. The segmental level desirable to be achieved was T4-T5 to enable introduction of the epigastric port.

The patient was monitored for blood pressure, SpO_2, heart rate and patient's anxiety. During surgery, oxygen supplementation was administered through a ventimask at the rate of 5L/minutes. Injection Tramadol 25 mg or Pentazocine 15 mg was administered as slow IV or in drip in all patients. Injection Ketamine 25 mg was administered as slow 1V in patients complaining of anxiety, neck pain, shoulder pain, or both. If the patient was not relieved, a dose of Ketamine was repeated and if patient was still anxious and uncomfortable, conversion to GA was done. Bradycardia below 50 per minute was managed by 0.3 mg-0.6mg atropine IV or 0.2mg glycopyrolate. Hypotension, defined as a fall in blood pressure (BP) of greater than 20% of pre-anaesthesia BP at any time after SA, during or after surgery, was managed by 3 to 6 mg Mephentermine IV intermittently up to a maximum of 15mg. The laparoscopic procedure was carried out in the standard fashion with four ports without any modifications. The intraperitoneal pressure was kept between 8mm to 12 mmHg. The postoperative parameters evaluated (in non-sedated patients) included operative site pain, assessed by a verbal numeric pain scale: no pain, mild bearable pain not requiring any medication, moderate pain and severe pain, both requiring medication. The other parameters included were urinary retention, headache and the incidence of postoperative vomiting. These were compared with corresponding parameters of 100 patients undergoing LC under GA.

Results:

This retrospective study included 134 patients who underwent LC under SA and 100 patients who underwent LC under GA between June 2006 to July 2009. In SA group, 103 patients were females and rest of them were males. The average age was 41.8 years. In GA group, 78 patients were females and 22 were males and their average age was 39.2 years. In SA group, acute cholecystits with cholelithiasis was the indication for LC in 19.4% of cases against 14% in GA group. In rest of the patients in both the group, LC was performed for chronic cholecystitis with cholelithiasis.

Average operative time required in elective LC was 28.4 minutes in SA group and 32.2 minutes in GA group. During emergency LC, in SA group a mean of 41.1 minutes was needed whereas 42.4 minutes was needed in GA group. The difference was insignificant. During operation under SA, 28 patients had hypotension, 32 had anxiety/neck & shoulder pain. Stomach distension requiring insertion of Ryle's tube was noticed in 2 patients against 82 patients in GA group. The difference was significant (p<0.01). Two patients of SA group had to be given GA due to failure of SA in one and neck & shoulder pain in another which was not relieved by drugs (Table III).

Postoperatively, the incidence of vomiting and pain treated with injectable analgesics or with oral drugs was significantly more in patients of GA group than SA group (p<0.01). However, the incidence of urinary retention was more in SA group (p<0.01). Headache was experienced by 8 patients in SA group only. Postoperative hospital stay on an average was 1.9 day in SA group and 2.1 day in GA group and the difference was insignificant (Table IV).

Table I: Profile of patients in SA and GA group.

		Spinal Anaesthesia (n=134)	General Anaesthesia (n=100)
Age	Average Years	41.8 Years	39.2%
Sex	Female	103(76.8%)	78(78%)
	Male	31(23.2%)	22(22%)
Indication			
Ac cholecystitis + Cholelithiasis		26(19.4%)	14(14%)
Ch. Cholecystitis + Cholelithiasis		108(80.6%)	86(86%)

Table II: Operating time In SA and GA group.

Operative time	Spinal Anaesthesia (n=134)	General Anaesthesia (n= 100)
Elective surgery in minutes	28.4 (16 – 54)	32.2 (17 - 59)
Emergency surgery in minutes	41.1 (19 – 92)	42.4 (21- 111)

Table III: Perioperative side effects in SA & GA group.

Perioperative	Spinal Anaesthesia (n= 134)	General Anaesthesia (n=100)	p value
Hypotension	28(20.89%)	-	-
Anxiety/Neck & Shoulder pain	32(23.88%)	-	-
Stomach distension requiring Ryle's tube	2(1.49%)	82(82%)	<0.01
Conversion to GA	2(1.49%)	NA	-

Table IV: Observations of post operative period in SA group.

Postoperative	Spinal Anaesthesia (n=134)	General Anaesthesia (n=100)	*p* value
Vomiting	4(2.9%)	33(33%)	<0.01
Pain treated with Injectable Analgesic	49(36.56%)	96(96%)	<0.01
Pain treated with oral analgesic	106(79.10%)	91(91%)	<0.01
Urinary retention	18(13.43%)	3(3%)	<0.01
Headache	8(5.97%)	0	<0.01
Average Stay in Hospital in days	1.9	2.1	NS

Discussion:

Regional anaesthesia is seldom used in abdominal laparoscopic surgeries except for diagnostic laparoscopies. The prime indication for using regional anaesthesia in therapeutic laparoscopy is still limited to patients unfit for GA, and the preferred type of regional anaesthesia is epidural anaesthesia. Thus, reports of laparoscopic surgery being done with patients under SA are even scarcer than those of patient's under epidural anesthesia (Hamad et al, 2003; Ciofolo et al, 1990). The optimal anterior abdominal wall relaxation, and the conscious and receptive patient under SA together with our experience of SA in open cholecystectomies for last eight years, inspired us to try SA for all LCs. Another reason for preferring SA was preventing the potential problems of GA. The initial concern was never the subcostal level of anaesthesia (T4-T5) for the epigastric and subcostal ports, because we had been successfully making upper abdominal incisions in open abdominal surgeries without discomfort to the patient. The pneumo-peritoneum induced rise in intra-abdominal pressure including pressure on the diaphragm and carbon dioxide induced peritoneal irritation were the factors to be considered. These factors could be overcome by changes in methodology of port-site placement and using nitrous oxide, which is less irritating for the peritoneum as compared to carbon dioxide; maintaining a low intra-peritoneal pressure of 8 mm of Hg when using SA have been reported to reduce the discomfort and chances of neck and shoulder pain (Putensen-Himmer et al, 1992). We have been operating at an average pressure of 10mm of Hg using carbon dioxide, and no changes were necessary in port placement in SA as compared with GA patients. Surprisingly, anxiety, neck pain and shoulder pain have never been a major problem in the present study. They occurred in only 23.88% of patients for which inj. Ketamine had to be given. One of them required conversion to GA. Pursnani et al (1998) noted that shoulder and neck pain occurred in 2 out of 6 patients operated under epidural anaesthesia, and it was easily managed. On the other hand, in the series of Hamad et al (2003), out of 310 LC performed under SA, only one patient had to be given GA because of intolerable shoulder pain. Chiu et al (1996) also noted shoulder pain in 1 of 11 patients of bilateral spermatic varices operated under epidural anaesthesia. The other reason for conversion in this study was an incomplete effect of SA.Conversion to GA because of abdominal distension & discomfort during epidural anaesthesia was reported in 1 of 11 patients by Chiu et al (1993). One out of 6 patients in the study by Ciofolo et al (1990) required conversion to an open procedure because of uncontrolled movements under epidural anaesthesia.

In addition to SA related hypotension, the pneumo-peritoneum induced rise in intra-abdominal pressure could be another cause for the persistence of hypotension. In the present study, the incidence of hypotension was comparable in LC performed under SA and open surgery with SA. Hartmen et al (2002) reported hypotension in 5.4% of cases, Palachewa et al (2001) in 15.7%, Throngnumchai et al (1999) in 20.2% of their cases of SA group as compared to 20.89% cases of the present study. This conclusively proves that the incidence of hypotension is no different whether laparoscopic surgery or open surgery is being done under SA and that an intra-peritoneal pressure of 8mm Hg to 12 mm Hg does not add to the problem of decreased venous return and persistence of hypotension. Although, Chiu et al (1996) have mentioned that a high SA block up to T2-T4 may cause myocardial depression and reduction in venous return, this was not substantiated in our series. An added advantage cited has been the decrease in surgical bed oozing because of hypotension, bradycardia, and improved venous drainage associated with SA (Casey, 2000).

The main debatable point, however, seems to be the status of respiratory parameters among the two modes of anaesthesia during laparoscopic surgery. In this context it can be stated that spontaneous physiological respiration during SA would always be better than an assisted respiration as in GA. The

potentiality of intubation and ventilation-related problems including an increase in mechanical ventilation to achieve an adequate ventilation pressure exists during GA as compared to SA. In addition, pulmonary function takes 24 hours to return to normal after laparoscopic surgery under GA (Putensen-Himmer et al, 1992). However, the observations are not uniform, and conflicting reports of respiratory parameter alterations in patients under regional anaesthesia and GA are present. On the other hand, Chiu et al (1996) reported a significant arterial blood gas alteration during epidural anaesthesia. Ciofolo et al (1990) concluded that epidural anaesthesia for laparoscopy does not cause ventilatory depression. Even, in the present series, none of the patients had any significant variation in PaO2 or PaCO2 during the surgery with SA.

No significant difference was noticed in operating time under SA or GA. Instead, the time from application of total anaesthesia to wheeling the patient out of the operating room actually decreases appreciably when the patient is being operated under SA, because the intubation and extubation time of GA is saved.

Preoperative shoulder pain never persisted in the postoperative period. In the postoperative period after SA, there was no restlessness as is commonly seen after GA, and the patient is always receptive and more compliant to suggestions. A specific advantage of SA seems to be the decrease in the requirement of postoperative analgesia. Injectable diclofenac was required by 36.56% of SA patients for their abdominal pain as compared to 96% of GA group. The injectable analgesic was required between 2 to 6 hours after surgery in SA while within 2 hours after extubation in GA patients. Postural headache was seen in 5.9% of patients of SA group, which persisted for an average of 2.3 days, and responded when the patient was made to lie down and with an increased intake of fluids and salt. Complication of SA in LC is seen less as compared to the study of Palachewa et all (2001). Headache was not observed in GA group. The significantly high incidence of urinary retention in patients operated under SA could be due to the prolongation of muscle paralysis with SA. Complications like sore throat, relaxant-induced muscle pain, dizziness, and postoperative nausea and vomiting (PONV) often create high morbidity after GA. The problem with PONV was seen in 2.9% of our SA patients, but has been reported as high as 8.1% in study by Sinha et all (2008). Another important advantage of SA is that other complications specific to GA, including cardiac, myogenic, and possible cerebral complications do not occur with SA. Mobilization and ambulation in both SA and GA patients was achievable within 8 hours to 12 hours after surgery.

It can be concluded that LC under SA is a better alternative as there is no intubation related airway obstruction, little risk of unrecognised hypoglycaemia in a diabetic patient, excellent muscle relaxation, decreased surgical bed oozing, economical, pain free, early post-operative period, a more rapid return of gut function and decreased postoperative nausea & vomiting. This is in addition to the obvious advantages in an old patient or those with COPD or other systemic diseases like hepatic and renal disease and diabetes.

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Research Article

Antibiogram of Group B Streptococci Isolated from the Vagina of Pregnant Women in Third Trimester of Pregnancy

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Abstract:

Group B streptococcal (GBS) prevalence varies from place to place; this organism is responsible for serious infections in newborns, such as septicemia and meningitis. The present study was aimed to find out the antibiogram of Group B Streptococci isolated from the vagina of pregnant women who were in the third trimester of pregnancy and to identify the risk factors for its colonization in vagina. The study was carried out in the Department of Microbiology, M. R. Medical College & Hospital, Gulbarga during a period from January 2007 to December 2007. Two hundred pregnant women who were in the third trimester of pregnancy and attending the antenatal clinics were included in the study. Two low vaginal swabs were taken from each women included in the study and were immediately transported to the laboratory for processing. Direct gram staining was done from one swab and the other swab was inoculated into sheep blood agar plate and incubated at 37ºC for 24-48 hours. Identification of organism was based on gram staining, colony morphology, catalase reaction, Christie Atkins Munch Petersen (CAMP) and Hippurate hydrolysis test.

Of the 200 pregnant women screened, 7.5% were colonized by GBS. Incidence of GBS colonization was higher among pregnant women in the third trimester who were 25 years of age and primigravida. All the isolates were sensitive to Ampicillin, Erythromycin and Penicillin but were resistant to Gentamicin and Kanamycin.

Key Words: Group B streptococcus; Colonization; Drug resistance, Drug sensitivity.

Introduction:

Group B streptococci (GBS), which is a beta-hemolytic streptococci of Lancefield Group B, has been causally linked to human diseases since 1938 (Lancefield, 1938). Group B streptococci has become the leading pathogen causing serious neonatal infections like sepsis and meningitis (Eickhoff et al, 1964; Hood et al 1961). The GBS is present in 15-20% of pregnant women in the lower vaginal tract (Hoogkamp-Korstanje et al, 1982). Colonization of GBS in the neonate usually occurs during its passage through the birth canal (Baker et al, 1973; Baker et al, 1977) . The mother's birth canal is the principal reservoir of this infectious agent for infants (Franciosi et al, 1973). In India, very few studies have been carried out, mainly to study the prevalence of GBS infections during pregnancy. The incidence of GBS colonization in the vaginal flora of pregnant women varied from 0.47 to 23.3% as reported by various workers (Baker et al, 1977; Beachler et al, 1979; Yow et al, 1980; Kishore et al, 1986; Arora et al, 1994; Lakshmi et al, 1998).

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Hence, the present study was planned to know the magnitude of GBS colonization, and antibiogram of isolates from the vagina with a view to determine the pattern of antibiotic resistance among pregnant women in the third trimester of pregnancy.

Material and Methods:

The present hospital based cross sectional study was carried out in the antenatal clinic & Department of Microbiology, M.R. Medical College, Gulbarga, from January 2007 to December 2007. A recent study, carried out by Valkenburg-van den Berg et al (2006) showed the GBS carriage rate in late pregnancy to be 21%. Considering this prevalence of GBS carriage rate, sample size was calculated.

A total of 200 pregnant women attending Antenatal clinics (ANC) were included in the study. The inclusion criteria for study were the presence of signs & symptoms of pregnancy & willingness to participate in the study. These women were in the age group of 19 to 37 years. Each week, 4-5 pregnant women who were in the third trimester of pregnancy (29-40 weeks) were selected during the study period of one year. Detailed history of each case was taken

during their clinical examination. Group B streptococcal positive women were divided in three groups: Group I: ≤ 20 years; Group II: 21 to 25 years and Group III: women above 25 years.

Two low vaginal swabs were taken aseptically prior to first pelvic examination. The swabs were immediately transported to the Microbiology laboratory. Modified Stuarts transport media was used in case of delay. One swab was used for direct gram staining and the other swab was inoculated on to sheep blood agar containing 5% sheep blood; it was incubated at 37ºC for 24-48 hours. Identification was done based on gram stain, colony morphology, catalase reaction, CAMP test, hippurate hydrolysis test and Lancefield grouping.

The presumptive diagnosis of GBS was based on the following criteria:
(i) Direct gram staining showing gram positive cocci arranged in pairs and short chains. (ii) The colony appearance of GBS on sheep blood agar at 24 hours is usually grey, smooth, shiny, convex, moist, regular, soft and mucoid in appearance and about 1 mm in diameter, often surrounded by a small hazy zone of beta-hemolysis.

The confirmation of GBS was made by subculturing colony from the blood agar on to chocolate agar to check the catalase activity. A clean (grease free) glass slide was taken, 1 or 2 drops of H_2O_2 (3%) was put on the slide. Using a clean glass rod, a colony was picked and dipped into H_2O_2. Staphylococci produce catalase while streptotocci does not. Effervescence is seen in positive catalase test where as no effervescence is seen in negative catalase test. Other confirmatory tests carried out were CAMP and Hippurate hydrolysis test. Grouping of Streptococci was done by the Lancefield's method.

Antimicrobial sensitivity of the GBS was done by the Kirby-Bauer disc diffusion method (de Lourdes et al, 1981). Fresh sub-cultures of GBS were used after overnight growth (16 hours) on blood agar plate. The inoculum was prepared by suspending several of the colonies in sterile phosphate buffered saline (pH 7.2) to achieve a turbidity of 0.5 McFarland standard. This resulted in a suspension containing approximately $1\text{-}2 \times 10^8$ CFU/ml. A sterile cotton swab was dipped into the bacterial suspension, elevated above the liquid and rotated several times against the inside wall of the tube to remove excess of the inoculum. This swab was streaked evenly in three different directions onto the blood agar containing 5% sheep blood.

Six antibiotic discs were employed namely Penicillin (10 µg/disc), Erythromycin (15 µg/disc), Ampicillin (10 µg/ disc), Gentamicin (10 µg/ disc), Chloramphenicol (30 µg/disc) & Kanamycin (30 µg/disc).

The data was analyzed and interpreted. The fisher's exact test was used.

Results:

In the present study, out of 200 women, 15 (7.5 %) showed GBS colonization (Fig. I). Among GBS positive women, 53.3% belonged to Group I, 40% to Group II and 6.7% to Group III. The maximum number of GBS positive women were primigravida (46.7%), followed by second gravida (33.3%), third gravida (13.3%) and only 6.7% were multi gravida. No multi gravida women above 20 years of age showed GBS colonization. The relationship between GBS colonization with age & gravida was not statistically significant (Table I).

All the strains were 100% sensitive to ampicillin, erythromycin and penicillin followed by chloramphenicol (66.6%). A marked resistance was observed with Gentamicin (100%) and Kanamycin (80%) as shown in Fig. II.

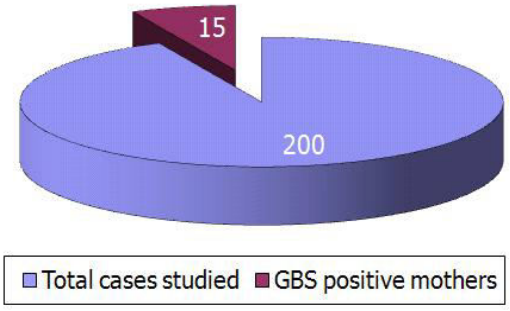

Fig. I: Incidence of GBS in third trimester of pregnancy.

Discussion:

Group A streptococci had a place of pride as causative agent of important clinical diseases and syndrome till recently; other members of this family are now coming to light as human pathogens and Group B streptococci is topping the list since the last few decades. In the present study the prevalence rate of GBS colonization was 7.5 % in third trimester. The incidence was higher amongst primigravida followed by second gravida. Kishore et al (1986) showed the incidence to be as low as 0.47%. In the study of Baker et al (1977) & Beachler et al (1979), the vaginal colonization of GBS was shown to be 18% & 23.4% respectively. Yow et al (1980) showed that 12% of

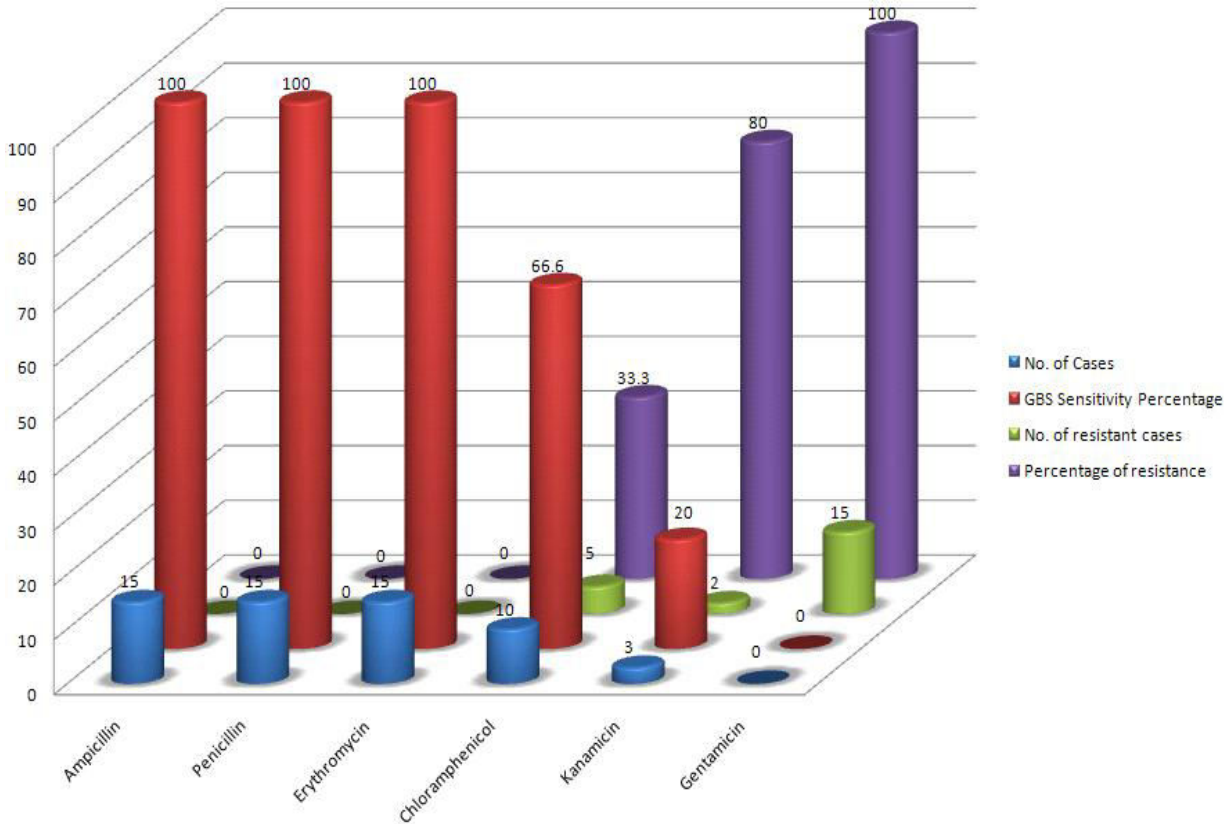

Fig. II: Antibiotic Sensitivity testing of 15 GBS isolates in third trimester of pregnancy

Table I: Distribution of GBS positive pregnant women according to age & parity.

Age Group	Primi gravida no(%)	Second gravida no(%)	Third gravida no(%)	Multi gravida no(%)	Total no(%)	f	*p* value
≤20 years	3 (20.00)	3(20.00)	1(6.66)	1(6.7)	8(53.3)		
21 – 25	3 (20.00)	2(13.33)	1(6.66)	0(0.00)	6(40.00)	0.058	0.62
26 – 30 years	1 (6.66)	0(0.00)	0(0.00)	0(0.00)	1(6.7)		
Total	7(46.7)	5(33.3)	2(13.3)	1(6.7)	15(100)		

pregnant women were colonized by GBS. An epidemiological study carried out by Stoll et al(1998), showed a prevalence of 12% in Indo-Pakistan region. In the year 2002, Grimwood et al showed the colonization rate of GBS to be 22%. In a recent study by Valkenburg-van denBerg et al (2006), the GBS carriage rate in late pregnancy was observed to be 21%. Papapetropoulou & Kondakis (1987) and Suara et al (1994), showed incidence of 12% and 22% respectively. In comparison to the above studies, the present study showed the incidence of colonization rate to be much lower (7.5%).

In contrast, study of deLourdes et al (1981) and Dillon et al (1982), showed the colonization rate of only 4%. The colonization rate of the present study (7.5%), was found to be at par with that of Lewin & Amstey, 1981(7.8%). The reasons for variation in incidence in different studies may be attributed to the fact that maternal colonization with GBS varies from place to place. Other factors that may have contributed to this variation include: socio-economic factors; variation in sample collection and the technique used for sampling. Ethnic and genetic factors might play a role in variation of the incidence of colonization with GBS.

In the present study, the antibiotic sensitivity testing of GBS isolates showed that all the Group B streptococci were 100% sensitive to ampicillin, penicillin and erythromycin followed by chloramphenicol (66.6%). A high resistance was seen with gentamicin (100%).

Olanisebe & Adetosoye (1986) reported that

all the 8 GBS isolates were sensitive to erythromycin, methicillin, penicillin G, ampicillin and chloramphenicol in decending order. They were resistant to tetracycline, sulphamethoxazole and streptomycin. However, in contrast to the present study, Lakshmi et al (1988) showed penicillin and erythromycin sensitivity against GBS to be 81.8% & 72.7% respectively. Arora et al (1994) also found all the GBS strains to be sensitive to penicillin and ampicillin. However, they observed resistance to gentamycin, chloramphenicol and erythromycin.

Conclusion & Recommendation:

Since genital colonization of parturient women continues to be the single most significant factor in GBS colonization of newborns, two methods of chemo-prophylaxis are being suggested to prevent vertical transmission. One such method of chemoprophylaxis against GBS is treating pregnant women colonized with GBS prior to delivery and second approach is to treat all neonates born to such women with penicillin shortly after birth.

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Case Series

Restoring Esthetics in Traumatic Tooth Fractures with all Ceramic Restorations following Endodontic Therapy: A Series of Cases

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Abstract:

Earlier Metal ceramic crowns were the restorations of choice in the management of traumatic tooth fractures. However, the inherent drawbacks of metal ceramic restorations and the development of newer all ceramic alternatives have resulted in superior esthetic and functional management of these clinical situations. The following case series describes the management of traumatic tooth fractures with Zirconia based all ceramic restorations following endodontic therapy.

Key Words: Tooth fracture, Endodontic therapy, Zirconia all ceramic crown.

Introduction:

Oral injuries are the fourth most common area of bodily injuries among 7–30 years olds (Rajab, 2000). Traumatic dental injuries can become an important health problem not only because their prevalence is relatively high, they have a large impact on the individual's daily life (Traebert et al, 2003). They constitute one of the leading reasons for odontological emergencies.

The traumatic injury of a permanent tooth can lead to the loss of pulp vitality. The traditional endodontic management of such cases typically includes debriding the root canal, disinfecting the space, and obturation of the root canal system.

Ceramic is the material of choice for long term esthetic dental restorations because they mimic enamel in terms of translucency and light transmission. The role of ceramic in dentistry has increased with the development of its ability to fuse with alloys. Metal-ceramic restorations remain the most common application of ceramics in dentistry today. These restorations provide excellent fit, esthetics, minimal fracture and have proven ability to survive in different clinical environments for extended periods. However, the alloy substructure of these restorations can limit their esthetic potential. Depending on the colour of the alloy-oxide layer and the clinical situation, the alloy oxide may be difficult to mask with opaque porcelain. Because of this problem, the colour matching of the veneering ceramic may be compromised by the alloy oxide colour or an inadequate veneering thickness. The alloy substructure may be difficult to hide esthetically in anterior restorations, particularly at the facial-gingival margins. In addition, some patients may have an allergic reaction to certain metals, particularly nickel and cobalt. These disadvantages have led to the development of all ceramic restorations (Abraham et al, 2010).

All ceramic restorations provide excellent esthetics. However, the low flexural strength of these restorations results in their high incidence of fracture, even when the clinical use is restricted to anterior and non stress bearing regions (Kristallis & Phimmasone, 2006).

All-ceramic fixed partial denture (FPD) cores are being fabricated from Yttrium Tetragonal Zirconia poly crystals (Y-TZP). These materials have excellent mechanical properties and bio-compatibility. These Zirconia based ceramics are indicated for a wide variety of restorations from single units to long span bridges (Piconi & Maccauro, 1999). It is an optimal material of choice for metal-free restorations because of its biocompatibility, strength and durability (Filser et al, 2001). The Zirconia restorations are veneered with leucite-free porcelain systems for thermal expansion matching. These systems show excellent bond strengths to the Zirconia base, better clinical outcome and acceptable marginal fit (Kelly, 2004; Raigrodski, 2004; Yilmaz et al, 2007; Wolfort et al, 2009).

This case series highlights the use of Zirconia based ceramics as a viable alternative to lithium-di-silicate base ceramics and metal-ceramic restorations especially in restoring anterior dental esthetics.

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Case 1:

A 20 year old male suffered an accidental trauma involving the maxillary anterior region of the mouth. Clinical examination revealed Ellis Class III fracture of the maxillary right central and lateral incisors with pulpal involvement (Fig. I). Soft and hard tissue examination showed no signs of scarring or any other evidence indicating previous trauma. Radiographic examination revealed fracture of maxillary right central and lateral incisors involving the pulp with no periapical or peri-radicular pathology (Fig. II). The patient complained of pain in both the teeth and tenderness to apical palpation and percussion.

A decision was made to perform endodontic therapy on both, the central and the lateral incisors. The maxillary incisors were endodontically treated according to standard protocol (Fig. III). Once the teeth were asymptomatic, the prepared access cavities were filled with composite resin, and the preparation for all ceramic crowns (Cercon Zirconia, Dentsply) was done according to the accepted guidelines. Gingival retraction was done by double cord technique and impressions were made with polyvinyl siloxane impression material. Provisional restorations were fabricated with self-cured composite resin and cemented on to the prepared teeth with temporary cement. After fabrication of the definitive restorations, the provisional restorations were removed; the definitive preparations were cleaned with pumice slurry. The preparations were rinsed and lightly air dried. The prepared teeth were isolated, and the crowns were then cemented with resin luting cement following manufacturer's recommendations (Fig. IV).

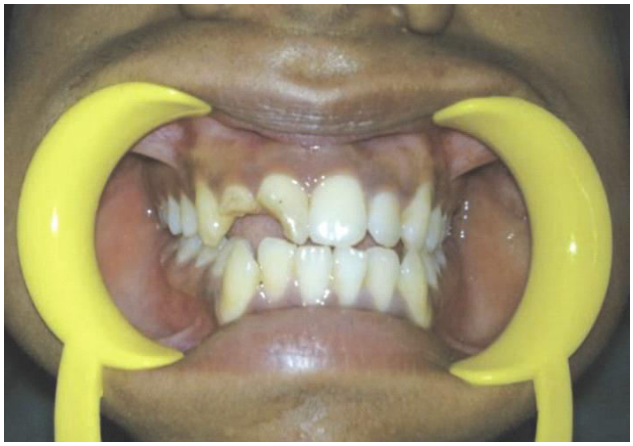

Fig. I: Photograph showing fractured 11 & 12.

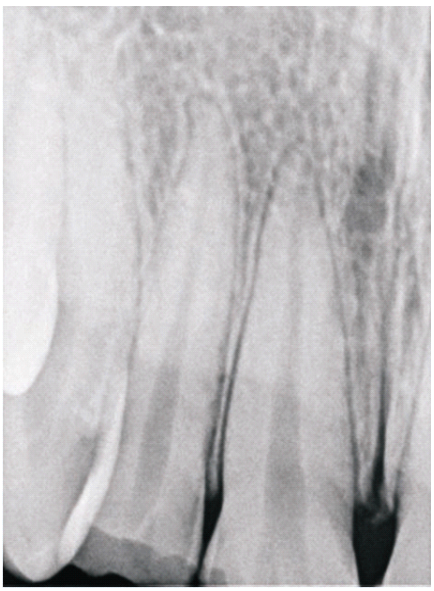

Fig. II: Photograph of preoperative radiograph.

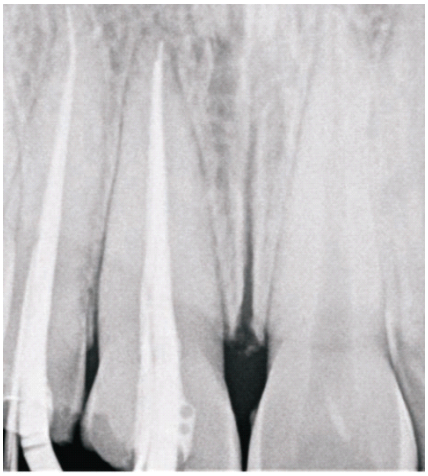

Fig. III: Photograph showing post-obturation radiograph of 11 & 12.

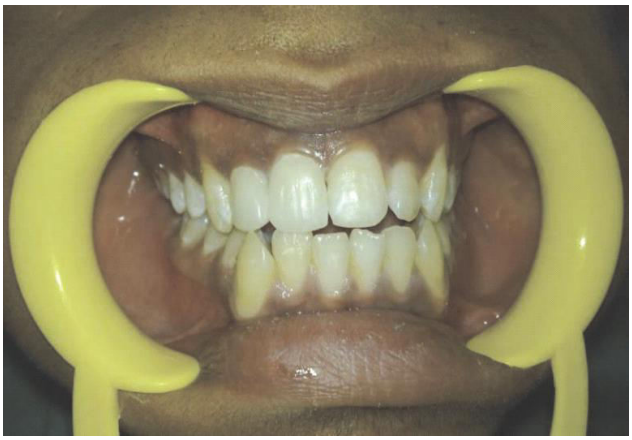

Fig. IV: Photograph showing cemented crowns in 11 & 12.

Case 2:

A female patient aged 18 years reported with a traumatic injury to both the maxillary central incisors. Clinical examination revealed Ellis Class III fracture

of maxillary right central incisor, and Ellis Class II fracture of maxillary left central incisor (Fig. V). Radiological examination corroborated the clinical findings (Fig. VI). Based upon the clinical and radiographic findings, endodontic therapy followed by an all ceramic crown (Cercon Zirconia, Dentsply) was advised for the maxillary right central incisor and a composite resin restoration (Ceramex Duo, Dentsply) was advised for the left central incisor. The patient was informed of the treatment plan and consent was taken. The decided treatment was then performed according to the accepted protocols (Fig. VII, VIII, IX).

Case 3:

An 18 year old female patient reported with a traumatic injury to both the maxillary central incisors

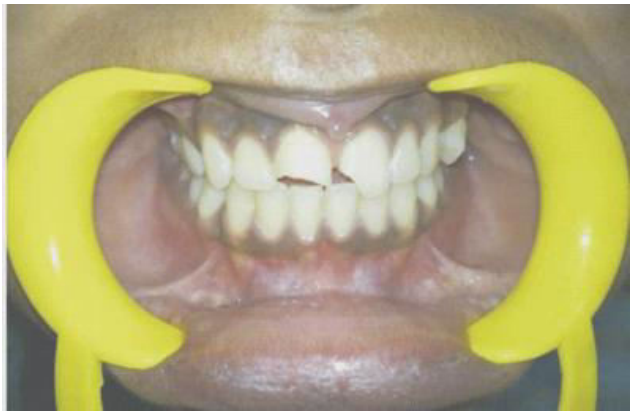

Fig. V: Photograph of fractured 11 & 21.

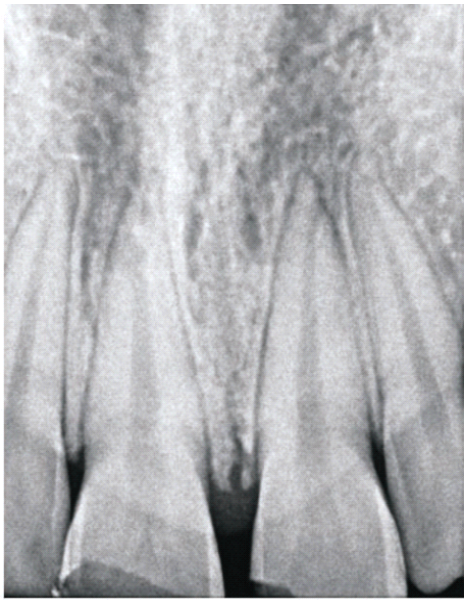

Fig. VI: Photograph of preoperative radiograph.

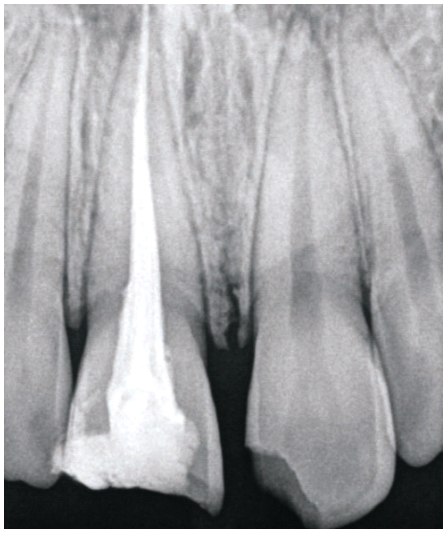

Fig. VII: Post obturation radiograph of 11.

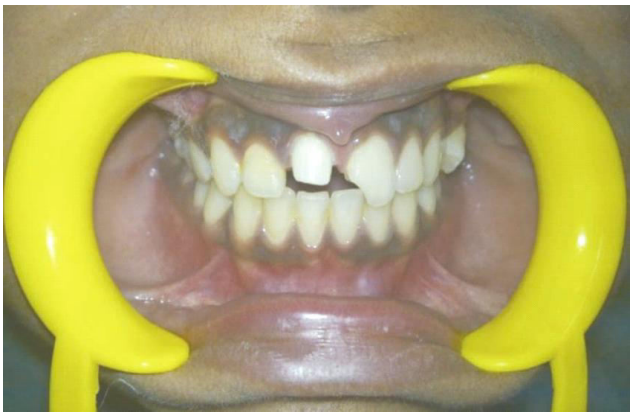

Fig. VIII: Photgraph showing tooth preparation of 11.

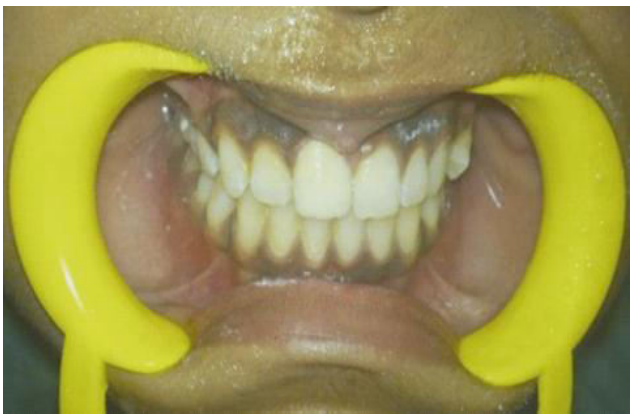

Fig. IX: Photograph showing cemented crown in 11 & composite in 21.

(Fig. X). Clinical examination revealed Ellis Class III fracture of the maxillary right central incisor. Radiological examination corroborated the clinical findings (Fig XI). Although the maxillary left central incisor showed no apparent abnormality clinically, but

tested non-vital to pulp testing. The patient complained of pain in both the teeth and tenderness to apical palpation and percussion.

Based upon the clinical and radiological findings, endodontic therapy followed by an all ceramic crown (Cercon Zirconia, Dentsply) was advised for both the maxillary right and left central incisors. The patient was informed of the treatment plan and consent was taken. The decided treatment was then performed according to accepted protocols (Fig. XII, XIII, XIV).

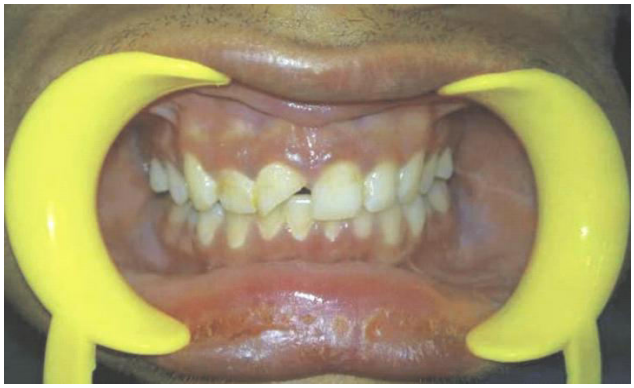

Fig. X: Photograph showing fractured 11.

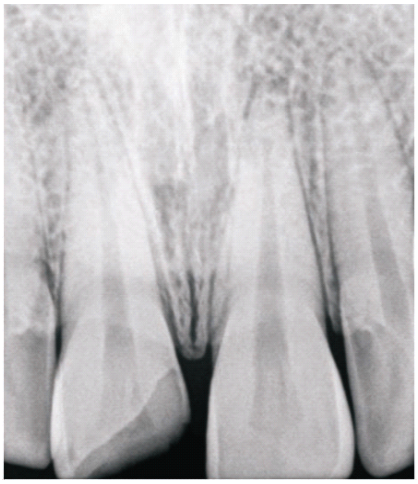

Fig. XI: Preoperative radiograph.

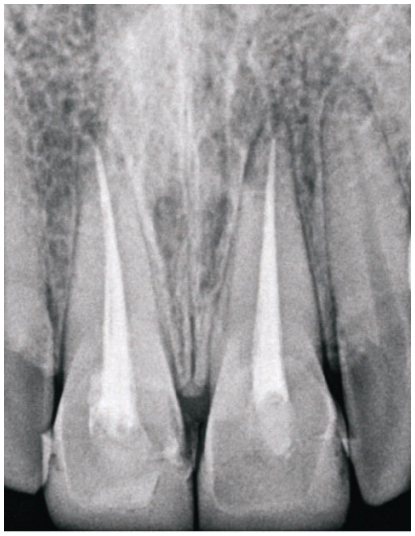

Fig. XII: Post obturation radiograph.

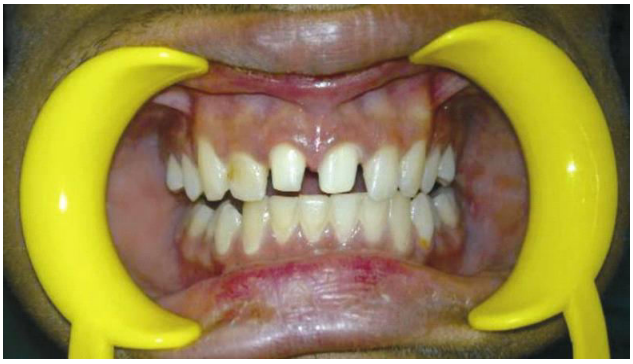

Fig. XIII: Photograph showing tooth preparations.

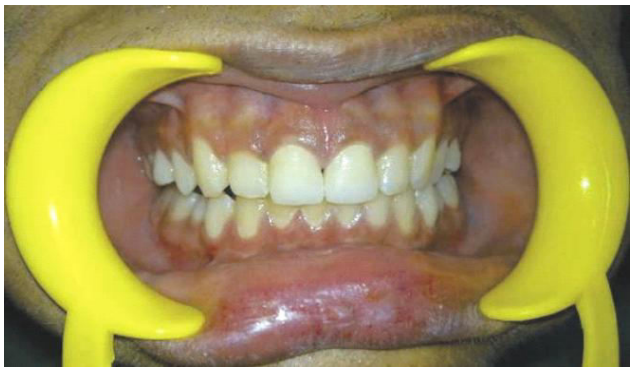

Fig. XIV: Photograph showing cemented crowns in 11 & 21.

Discussion:

Several restorative systems for fabricating all-ceramic crowns and bridges have been tested and are being tested in clinical studies for their long-term success. Yttrium tetragonal Zirconia polycrystals-based systems are the most recent version being tested with the emphasis on the use of computer-assisted design/ computer-assisted manufacturing (CAD /CAM) technology. These systems are being tested for their predictability as compared to metal-ceramic prostheses, which remain the gold standard in terms of their predictability (Yilmaz et al, 2007; Raigrodski, 2004). The recent ceramic systems that have received notable attention in peer-reviewed literature are: (1) a leucite-reinforced glass(Empress, Ivoclar), (2) a glass-infiltrated alumina (In-Ceram Vita), (3) a glass-infiltrated magnesium aluminate spinell (In-Ceram Spinell, Vita), (4) a poly-crystalline alumina (Procera, Nobel Biocare), (5) a glass-infiltrated alumina/Zirconia (In-Ceram Zirconia, Vita) and (6) transformation toughened polycrystalline Zirconia (Cercon, Dentsply Prosthetics: Lava, 3M-ESPE , Procera-Z, Nobel

Biocare). Amongst these systems, lowest fracture rates have been reported for the last two mentioned systems.

The esthetic advantages of all ceramic systems are real when the completely light- blocking metal is replaced even by an opaque ceramic. All ceramic systems can provide a better esthetic result for a wide range of patients than can metal-ceramics because a wide range of translucency opacity can be achieved with commercially available ceramic systems. Other advantages relate as much to the soft tissue health as to esthetics. Lesser amounts of plaque and adherence molecules are recovered from ceramic surfaces than from gold alloys or base-metal alloys. Secondly, intra-oral plaque of a qualitatively healthier composition can form on ceramic surfaces. It is often acceptable to leave the margins of all-ceramic prostheses supragingival or at the gingival margin, with the added benefit of more predictable and less traumatic impression making. Emergence profiles are less likely to be overcontoured, as it is often the result with metal-ceramic prostheses due to the efforts to provide a thicker layer of porcelain to mask the opaque-metal surface (Yilmaz et al, 2007).

The use of all ceramic restorations increases the depth of translucency and light transmission across the entire restoration. Some systems use a single white shade for the core. The core has masking ability and once milled, it can be coloured into one of the seven shades corresponding to the Vita-Lumin shade guide before the final sintering procedures. This allows the development of the shade of the restoration from its intaglio surface all the way to the outer aspect of the veneering porcelain. The ability to control the shade of the core may also eliminate the need to veneer the lingual and gingival aspects in cases where the inter-occlusal distance is limited. In addition, the palatal aspect of anterior crowns may be fabricated entirely of the core material in patients who lack space for lingual veneering porcelain. All ceramic systems also have reduced thermal conductivity resulting in less thermal sensitivity and potential irritation. Glass infiltrated leucite has always been the first choice for anterior restorations, especially in cases of highly translucent teeth. Glass infiltrated leucite reinforced ceramics provide better translucency but have very low flexural strength when compared to the newer generation yttrium based zirconia. Lithium based crowns also have the disadvantage of sub critical crack propagation due to stress corrosion caused by water in saliva reacting with glass resulting in decomposition of glass structure leading to increased crack propagation (Raigrodski, 2004).

The selection criteria according to Yilmaz et al (2007) & Raigrodski (2004) for all ceramic systems should be:-

1. Value of the dentition.
2. Cementation.
3. Clinical indications.
4. Strength.

In highly opaque teeth, where translucency is not required an opaque substructure will impart the desired and accompanying strength. When translucency is required in lithium-di-silicate based ceramics, the primary requirement for cementation is the formation of a micro mechanical bond which can be achieved by etching and bonding protocol of cementation. Zirconia based ceramics provide very little micro mechanical retention even after etching. The zirconium based crowns can be cemented by using glass ionomer cement or resin based cements, giving an option to the dentist.

Clinical situations like deep bite, class II div 2, or in teeth with already existing metal post or amalgam core where lithium-based crowns cannot be used, Zirconia based crowns provide a viable alternative to metal-ceramic and lithium based crowns (Raigrodski, 2004). Therefore, it is of utmost importance that during diagnosis and treatment planning, careful examination of the available edentulous space and inter occlusal distance be carried out. A 4mm clinical measurement with a periodontal probe from the inter dental papilla to the marginal ridge of the prospective abutment indicates adequate connector height for most all ceramic FPDs (Raigrodski, 2004). Even short clinical crown height may restrict the height of the connector.

Zirconia based all ceramic FPDs exhibits better fracture resistance of 1457 N when cemented with glass ionomer cement, which is well beyond 1000N. It also provide excellent esthetics if used in the appropriate clinical situation (Raigrodski, 2004). In all the cases reported above, Zirconia based restorations provided good mechanical and esthetic results.

Conclusion:

This article describes the restoration of function and esthetics following traumatic fracture of anterior teeth by endodontic treatment and Zirconia based all ceramic crowns. If proper clinical protocol is

followed, this system can provide optimal esthetics and function in routine as well as in unusual clinical situations.

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Case Series

Cryptococcal Lymphadenitis on Fine Needle Aspiration Cytology : A Report of 2 Cases

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Abstract:

Cryptococcal infection most commonly affects the lung, meninges and skin. The involvement of lymph node in cryptococcosis is considered to be rare and is usually observed in cases where the disease is very widely disseminated affecting the mediastinal and cervical lymph nodes. Disseminated cryptococcosis is a life threatening disease seen more commonly in patients with acquired immunodeficiency syndrome (AIDS) or other forms of immune suppression.
We report 2 cases of AIDS with cryptococcal lymphadenitis, diagnosed by fine needle aspiration cytology of the involved lymph node.

Key Words: Lymphadenitis, Cryptococcus neoformans, Fine needle aspiration cytology, Acquired immunodeficiency syndrome.

Introduction:

Human immunodeficiency virus (HIV) infection has emerged as a global epidemic and the data of the Center for Disease Control and prevention shows that cryptococcosis occurs in about 7% of acquired immunodeficiency syndrome (AIDS) patients (Ioachim & Ratech, 2002). Cryptococcosis is a chronic opportunistic infection caused by the encapsulated yeast *Cryptococcus neoformans* (Das et al, 2002). Primary infection is usually through the respiratory system but dissemination to central nervous system (CNS), skin, bone, lymph node, kidney and other viscera may occur. Disseminated cryptococcosis is a life-threatening disease seen more commonly in patients with AIDS and other forms of immunosuppression (Suchita et al, 2008).

Lymph node fine needle aspiration cytology (FNAC) in patients with cryptococcal lymphadenitis provides an economical and rather quickly accomplished cytodiagnosis.

Case 1 :

A 38 years old male presented to outpatient department with complaints of fever and swelling in the right side of the neck for one month with history of anorexia and weight loss. Patient was a known case of HIV infection and was on treatment. On examination, he was thin built and poorly nourished. Oral cavity showed whitish lesions suggestive of candidiasis. Multiple swellings were seen over the right supraclavicular region, largest measuring 2 cms in diameter, soft to firm, discrete, mobile and non tender. His blood investigations revealed hemoglobin level of 8.2gm%, total leukocyte count of 5100 cells/cu mm and CD_4 counts of 56 cells/cu mm. Erythrocyte sedimentation rate (ESR) by Westergren's method was 110 mm at the end of one hour; other biochemical investigations were within normal limits. His chest X-ray was unremarkable.

Smears from FNAC of right supraclavicular lymph node stained by Giemsa stain, revealed extensive necrotic background, amidst which, numerous

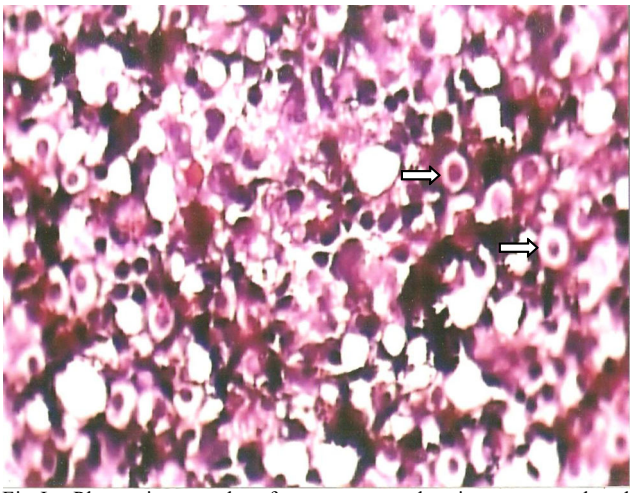

Fig.I: Photomicrograph of case one, showing encapsulated cryptococci in necrotic background (May Grunwald Giemsa stain, 400X).

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encapsulated budding yeast cells of varying sizes and surrounded by halos was seen with few lymphocytes, plasma cells, histiocytes and plump fibroblasts (Fig. I). The capsule was demonstrated by India ink preparation and Periodic Acid Schiff (PAS stain; Fig. II). Ziehl Nielsen's (ZN) staining did not reveal any acid fast bacilli, ruling out any coexisting tuberculous infection. A diagnosis of cryptococcal lymphadenitis was made. The patient was immediately started on antifungal treatment to which he responded.

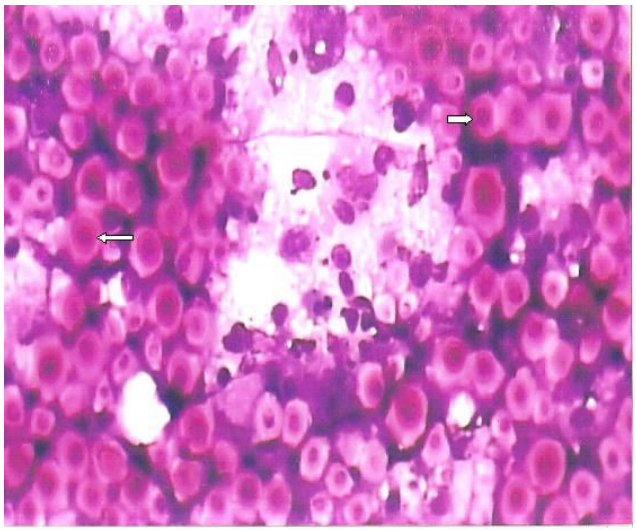

Fig. II: Photomicrograph of case one, highlighting the yeast forms (PAS stain, 400X).

Case 2 :

A 43 year old female patient was admitted with symptoms of fever, headache and vomiting of 8 days duration. Patient was a known case HIV infection and was on treatment. He was put on empirical treatment for tuberculosis for one month. On examination, the patient was found to be febrile with pulse rate 120 per minute and blood pressure 100/80 mm of Hg. She had mild pallor. Bilateral multiple axillary and inguinal lymph nodes were enlarged, largest being 3x2cm, soft to firm, non tender and mobile. Neck rigidity was present (Kernig's sign was positive) . Both plantar reflexes were extensor with exaggerated deep tendon reflexes of lower limb. Provisional diagnosis of meningitis was made for which she was further evaluated.

Her blood investigations revealed hemoglobin level of 7.6g%, total leukocyte count of 4100 cell/cu mm, CD_4 count of 72cells/cu mm & ESR by Westergren's method was 100 mm at the end of one hour, biochemical investigations were within normal limits. Her chest X-ray showed patchy interstitial infiltration.

Cerebrospinal fluid (CSF) examination revealed total count of 250 cells/cu mm with predominance of lymphocytes (80%), budding yeasts like organisms were also observed. India ink preparation revealed capsulation of yeast cells (Fig. III). Fine needle aspiration cytology of left axillary lymph node revealed amorphous granular background with scattered epithelioid cell and many encapsulated forms of cryptococci along with lymphocyte and histiocytes (Fig. IV). Periodic Acid Schiff was positive for budding yeasts; ZN staining of smears revealed acid fast bacilli, suggesting co-existing tuberculous infection.

A diagnosis of cryptococcal lymphadenitis and meningitis along with co-existing tuberculous infection was made. Additional antifungal treatment was started; patient showed signs of improvement.

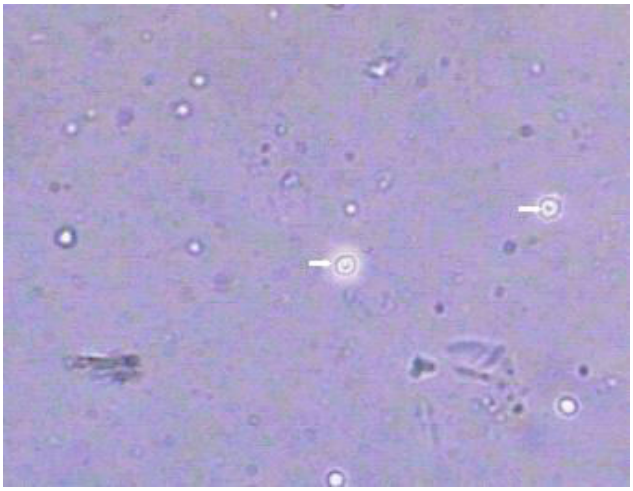

Fig. III: Photomicrograph of case two, highlighting cryptococcal capsule in CSF smear (India ink preparation, 400X).

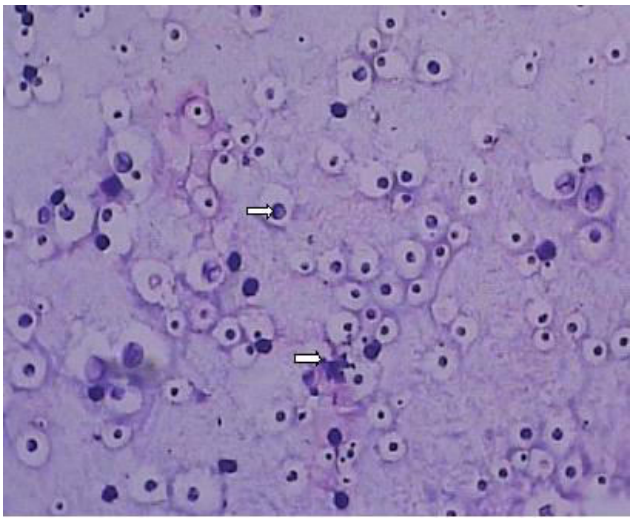

Fig. IV: Photomicrograph of case two, showing encapsulated cryptococci in amorphous granular background (May Grunwald Giemsa stain, 400X)

Discussion:

Cryptococcosis is a chronic opportunistic infection caused by the encapsulated yeast *Cryptococcus neoformans* which is present world wide, particularly in soil contaminated by pigeon excreta (Das et al 2002). Primary infection is usually through respiratory system by inhalation of infected dust, but dissemination to CNS, skin, bone, lymph node, kidney and other viscera occurs (Suchita et al, 2008).

Cryptococcal meningitis and disseminated cryptococcosis have gained importance recently because of the rapid rise in the world wide incidence of HIV infection (Das et al, 2002). Cryptococcus lymphadenitis is an uncommon form of extrapulmonary cryptococcosis, which is one of the AIDS defining criteria according to the Centre for Disease Control and prevention guidelines (Scheider et al, 2008).

Identification of cryptococcus has been reported from cytological specimens of CSF, sputum, bronchial washing and FNAC smears of the lymph nodes, thyroid, spleen, adrenal gland, bones and the lung (Wright et al, 2000; Kalra et al, 1999; Cox & Perfect, 1998). The organism is surrounded by a mucopolysaccharide capsule and measures 5-15µm in diameter. Special stains (Gomori's Methanamine Silver, PAS and Mucicarmine) facilitate the identification of this organism. Granulomatous inflammation, which may be slight or absent, can be caused by cryptococci (Lee et al, 2001). Both the cases of present study showed necrotic background with numerous budding yeast cells surrounded by halos. In the second case there were scattered epithelioid cells but no granuloma formation. Capsule was identified by special stains such as India ink preparation and PAS. Hence, diagnosis of cryptococcosis can be made cytologically on obtained smears when the mucopolysaccharide capsule is visualized with special stains.

Cryptococcal meningitis is the most common type of opportunistic CNS infection in AIDS patients in developed countries. However, in developing countries, tuberculosis is the most common cause of meningitis in AIDS patients (Das et al, 2002).
The diagnosis of Cryptococcosis could be definitely made by FNAC in both the cases of present study.

FNAC can thus be a simple and useful technique in the diagnosis of fungal infection. Identification of these organisms, with or without cellular reaction can lead to a rapid diagnosis and importantly an early initiation of specific and life saving treatment.

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Case Series

Two Uncommon Presentation of Cervical Fibroids

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Abstract:

Most of the leiomyomas are situated in the body of the uterus, but in 1-2% of the cases, they are confined to cervix and usually to the supravaginal portion. A cervical leiomyoma is commonly single and is either interstitial or subserous. Rarely it becomes submucous and polypoidal (Kumar et al, 2008). Two cases of cervical leiomyoma admitted with symptoms of menstrual abnormality are being presented. Cervical fibroids were attached to the cervical lips, were sub-mucous, sessile and were removed by vaginal myomectomy leaving the uteres intact.

Key Words: Cervical Fibroid, Vaginal myomectomy

Introduction:

Leiomyomas are the most common tumours of the uterus. They are responsible for about 1/3rd of hospital admissions to Gynaecology Department. Growth of leiomyoma is dependent on oestrogen production. The tumour thrives during the period of greatest ovarian activity. Continuous oestrogen secretion especially when uninterrupted by pregnancy and lactation is thought to be the most important risk factor in development of myomata. After menopause, with regression of ovarian oestrogen secretion, growth of leiomyoma usually ceases. Cervical fibroids develop in the wall of cervix (Tiltman, 1998). They can change the shape of the cervix or may lengthen it. If cervical fibroid get bigger, it may even push the uterus upwards. In some cases, cervical fibroid may grow rapidly and can obstruct the cervix. A cervical fibroid can lead to urinary retention, urinary frequency, constipation, menstrual abnormalities, dyspareunia, and sometimes post coital bleeding. Large cervical fibroids are difficult to handle and need an expert hand to operate these cases (Kshirsagar & Laddad, 2011).

Case 1:

A 20 years old patient came with the history of off and on bleeding per vaginum for last 6 months. She was married 1 year back and was nullipara. On general examination her blood pressure was 100/60 mm Hg and pallor +++. Her systemic examination including per abdominal examination was normal. Local examination of perineum showed a mass of a size of about 5 cm x 3 cm, coming out of vulva and there was bleeding per vaginum. Per speculum examination, revealed, growth coming out of cervix. Per vaginum examination showed uterus of normal size and fornices were clear. Per rectal examination revealed no additional finding.

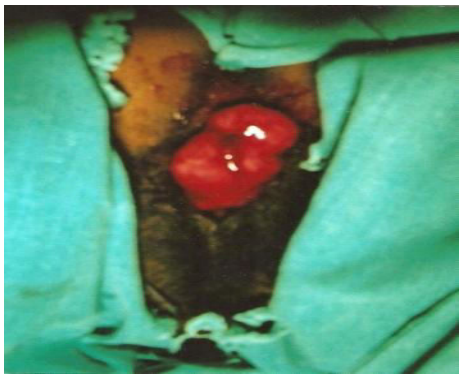

Fig I: Cervical Fibroid seen on Local Examination.

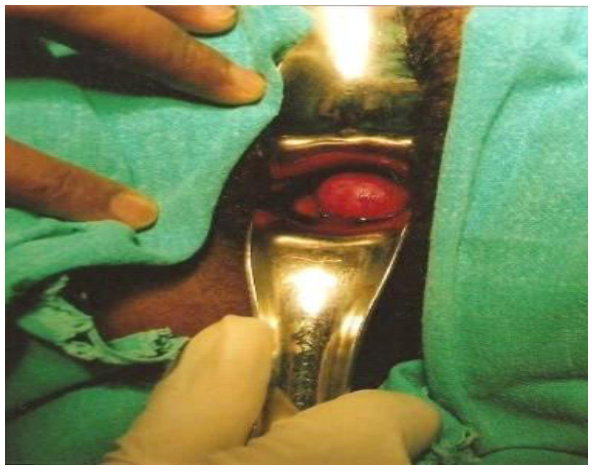

Fig II: Cervical Fibroid seen on per Speculum Examination.

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Her haemoglobin was 3.4gm/dl, TLC 6300/ cmm, DLC-P90, L08, E01 & M01, Blood Group was AB+ve. She was given blood transfusion. Vaginal myomectomy was done under aseptic conditions. It was removed by blunt and sharp dissection. Mass was attached to inside of the anterior cervical lip. It was sessile and had broad attachment at cervix. Haemostasis at base of attachment was achieved by haemostatic sutures and cautery.On Gross examination, it was found to be 6cm x 7cm in size, smooth with irregular surface.Cut section showed whorled appearance suggestive of leiomyoma.

Histopahological examination confirmed the diagnosis of leiomyoma.

Case 2:

A 25 years old female was P_{4+1}, admitted with complaints of off and on bleeding per vaginum for last 6 months. Her general examination was normal. On per speculum examination, an ulcerating growth was seen filling up whole vagina. Cervix could not be visualised. On per vaginal examination, cervix could not be felt and growth was continuous with the uterus. The uterus was around 12-14 weeks in size and fornices were clear. Per rectal examination was normal. Her haemoglobin was 8gm/dl; TLC 9,700/ cmm; DLC- P76, L20, E04 & M0. Blood transfusion was given to her. Examination under anaesthesia was done. A large firm solid growth was seen filling whole vagina. A thin rim of cervix surrounding growth was seen on posterior part of the growth. The growth was sessile with broad attachment, arising from inside the cervical lip on right lateral part. Cervical canal was dilated. Whole of the mass was removed by blunt and sharp dissection. Bleeding at the base of growth was controlled by haemostatic sutures and electro-cauterization. On gross examination, size of the leiomyoma was 9cm x 7cm, It had irregular surface with some areas of ulcerations. On cut section, it had whorled appearance suggestive of leiomyoma. Histopathological examination confirmed the diagnosis of leiomyoma of the uterus.

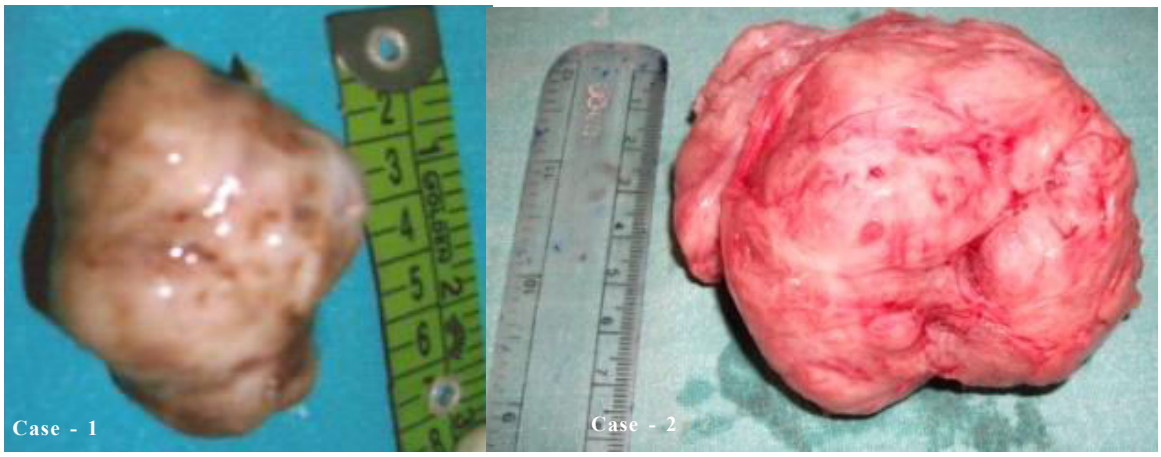

Fig.III: Gross appearence of leiomyomas after resection.

Discussion:

Uterine myoma is the most common indication of hysterectomy. Presence of isolated fibromyoma in cervix with intact uterus is in frequent. Cervical fibroids with excessive growth are uncommon. Cervical fibroids generally don't affect women's ability to become pregnant though cervical fibroids with pregnancy is rare. These fibroids grossly and histopathalogically identical to those found in the corpus. Fibroids with excessive growth may cause pressure symstoms. Treatment of cervical fibroid is either hystrectomy or myomectomy (Basnet et al, 2005). They may give rise to greater surgical difficulty by virtue of relative inaccessibility and close proximity to bladder and ureter (Kshirsagar & Laddad, 2011). But difficulty may be avoided by vaginal myomectomy, as tumour is inside cervical canal. Myomectomy can be performed by vaginal route in selected cases with low morbidity and a good short term success rate. It requires no skin incision and can be performed on the patients with submucous fibroids (Davies et al, 1999).

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Conflict of Interest: None declared.

Case Report

A Variant BORS in a 20 Weeks Foetus – A Case Report

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Abstract:

A still born male foetus of 20weeks gestation was brought to the Department of Anatomy from one of the private nursing homes in Vizianagaram as a part of routine research work in the department. Foetal autopsy revealed bilateral cleft lip with cleft palate, anotia (absence of ear pinna), absence of external acoustic meatus and auricular tags on the right side, where as left pinna and acoustic meatus were normal. Study also revealed anomalies in the right middle ear and internal ear. Orientation of thoracic and abdominal viscera was normal. There were two large cysts in the abdominal cavity in place of kidneys. Both ureters were dilated. Branchial arch anomalies, ear anomalies and renal anomalies constitute Melnick-Fraser syndrome, otherwise called as Branchio-oto-renal syndrome.

Key Words: Cleft lip, Cleft palate, BORS, Cystic kidneys.

Introduction:

Branchio-oto-renal (BOR) syndrome is a rare genetic disorder characterized by the auricular malformations, hearing loss, branchial arch anomalies and renal anomalies. It was first recognized by Melnick et al in 1975 and further delineated by Fraser et al (1978). Branchio-oto-renal syndrome is also known as Melnick-Fraser syndrome. Approximately 90% of individuals diagnosed with BORS have an autosomal dominant inheritance and have an affected parent, where as 10% of cases are caused by de novo- mutation syndrome (Soriano, 2003; Chang et al, 2004). The diagnosis of BOR spectrum disorders is diagnosed on clinical criteria. The prevalence of BORS ranges from 1:700000 (Fraser et al, 1978) to 1:40000 (Fraser et al, 1980). The syndrome occurs in about 2% of profoundly deaf children (Jones, 1988).

Case report:

A still born unclaimed male foetus was brought to the Department of Anatomy of Maharaj Institute of Medical Sciences, Vizianagram. On enquiry, the antenatal period of the mother was uneventful as per the hospital records available. The foetus was embalmed and fixed in 10% formalin. The age of the foetus was calculated by measuring crown rump length, and on its basis, the gestational period was calculated to be approximately 20 weeks.

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On external examination, both upper limbs and lower limbs were normal without any anomaly. The anal and urethral openings were normal. There was bilateral cleft lip with cleft palate (Fig I). There was absence of ear pinna and external acoustic meatus on the right side, where as left pinna and external acoustic meatus were normal (Fig II). On opening the thorax, lungs and heart were found to be normal. There was no malformation of the diaphragm.

A large cyst of irregular shape occupied the entire abdomen except left hypochondriac and epigastric region, which was occupied by coils of the small intestine. Sub-hepatic vermiform appendix was noted. Another, large irregular cyst was found in the left hypochondriac region (Fig 1). On gross examination, both kidneys were absent. Both the ureters were dilated and connected to above mentioned cysts and to the urinary bladder. The liver, stomach, pancreas and spleen were normal. Both right and left testes were

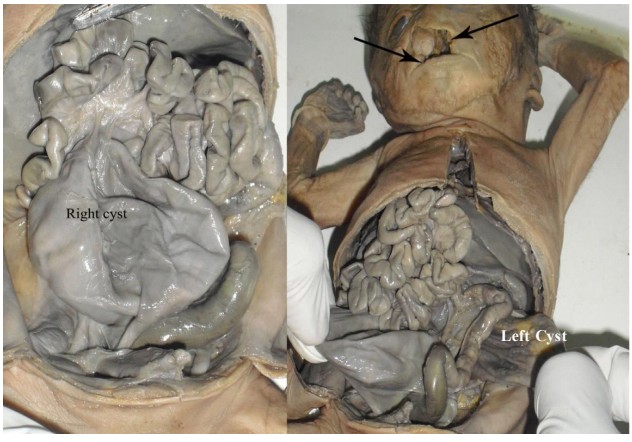

Fig I: Showing bilateral cleft lip with cleft palate and bilateral cysts occupying entire abdomen.

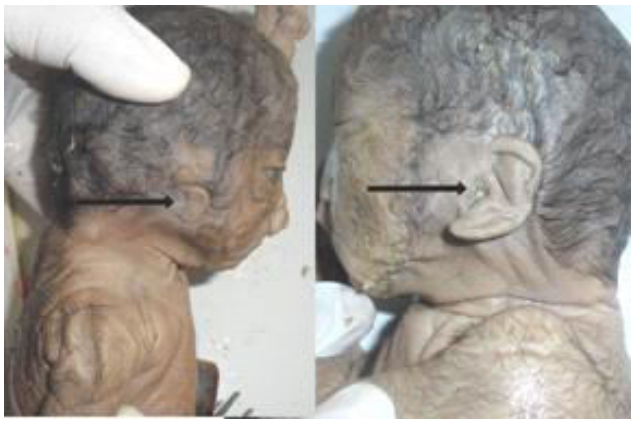

Fig II: Showing anotia and pre auricular tags on the right side and normal left pinna and external acoustic meatus.

still intra-abdominal overlying the right and left cysts (Fig. I). On histological examination, both the cysts revealed the following findings.

Right Cyst:

Capsule was well defined without any septa. Nephrogenic zone was not evident. Cortico- medullary differentiation was not appreciated. Very few glomeruli per field were noticed. Deeper glomeruli were large. Proximal convoluted and distal convoluted tubules were not well differentiated, as there was no differentiation of tubules, hence no pyramid formation was observed (Fig. IV a).

Left cyst:

Capsule was well defined without any septa. Thin nephrogenic zone was evident. Cortico- medullary differentiation was not appreciated. Relatively more number of glomeruli were noticed when compared with right cystic kidney. Proximal and distal convoluted tubules were appreciated. Presence of collecting ducts was evident, but without pyramid formation (Fig.IV b).

On opening the cranial cavity, the cerebral hemispheres were found to be normal. After removal of the cerebral hemispheres, tegmen tympani of petrous part of the temporal bone was removed on both the sides. There was hypoplasia of middle ear ossicles with complete aplasia of the internal ear (cochlea and vestibular apparatus were absent) on the right side, where as middle ear cavity of the left side showed three normal ossicles with normally developed semicircular canals and cochlea (Fig. III). The external auditory meatus on the right side was completely stenosed and was normal on the left side. No other anomaly of the 2nd branchial arch, such as cysts and fistulae were found on either side.

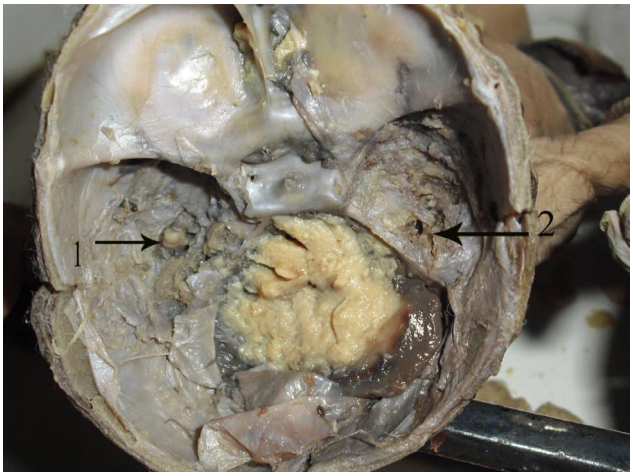

Fig. III: Showing normal middle ear ossicles on left side 1 & hypoplasia of ossicles on right side 2.

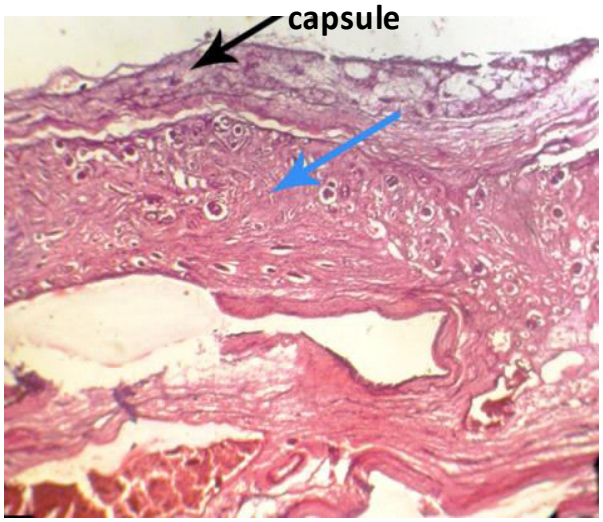

Fig. IV a: Showing no evidence of cortico medullary differentiation and Less number of glomeruli per field in right cystic kideny (H & E, 10x).

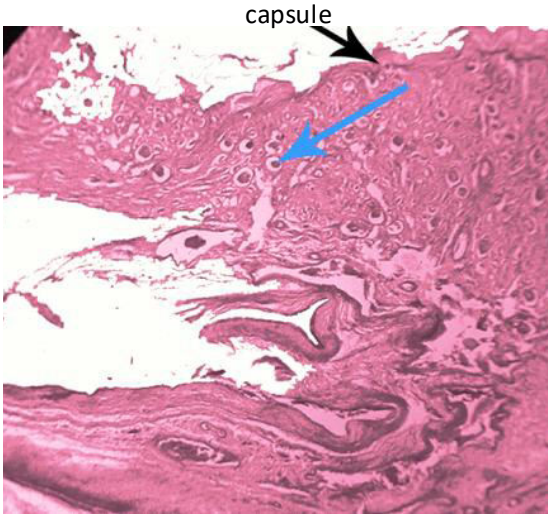

Fig. IV b: Showing evident naphrogenic zone and more number of glomeruli per field in left cystic kidney (H & E, 10x)..

Discussion:

Melnik-Fraser syndrome or Branchio-oto-renal dysplasia is characterised by external ear malformation, cervical fistulae, mixed hearing loss and renal anomalies, which is inherited in an autosomal dominant manner (90 % cases) and has variable clinical expression. Branchio-oto- renal syndrome gene was mapped to chromosome region 8q13.3 and its sequence was identified as the human homologue of the Drosophila eyes absent (EYA1) gene; other genes associated with mutation are SIX1 and SIX5 gene.

Stratakis et al (1998) studied Branchio -oculo-facial (BOF) syndrome with deafness, ear pits and associated conditions & BOR. They found that, though both the conditions are phenotypically similar but they differ genetically.

Kumar et al (1998) investigated Branchio-otic (BO) syndrome in a large family to determine whether BOR and BO syndromes were allelic to each other. On genetic linkage analysis, they found no evidence that BO syndrome is allelic to the BOR gene at 8q13. However, Clarke et al (2006) found that dominant mutations in the human homologue of the Drosophila eyes absent gene (EYA1) are frequently the cause of both BOR and BO syndrome. They studied the South African family of Afrikaner descent with effected individual presenting with pre-auricular abnormalities and either having hearing loss or bilateral absence of kidney. On genetic analysis of the pedigree they detected a novel EYA1 heterozygous nonsense mutation in effected family members but not in unaffected family members on a random DNA panel.

Jones (1988) reported ear deformities in 77 to 89% of cases, branchial fistulae and renal dysplasias in 63% cases each. Whereas, Chang et al (2004) observed 67% renal anomalies in a study of 21 affected individuals. Middle ear abnormalities include malformation, malposition, dislocation or fixation of ossicles. Internal ear abnormalities include agenesis of cochlea, and hypoplasia of semicircular canals (Kemperman et al, 2002).

The mechanism of development of dysplastic kidneys is not always clear and may be variable. It is generally accepted that renal dysplasia can be the result of very early in-utero urinary tract obstruction, whether it is at the level of urethra, bladder or ureter. The most severe dysplasia is the result of early obstruction with abnormal disappearance of nephrogenic blastema and subsequent arrest of nephrogenesis (Benacerraf et al, 1990). The present case is a variant of Melnick-Fraser syndrome, since mortality of foetus took place in the midterm, which could most probably be due to complete renal dysplasia. Zhang et al (2004) grouped this as due to EYA 1 mutation that is activating with resultant severe phenotype anomalies as presented. If a prenatal diagnosis is made a canaloplasty can be done to overcome hearing defect in some of the individuals affected. The BOR syndrome appears to belong to a larger group of hereditary ear dysplasia-renal adysplasia syndromes that must be carefully ruled out in all patients with familial branchial arch malformations as well as in the parents and siblings of infants with "Potter facies" in the presence of auricular malformation and renal adysplasia (Melnik et al, 1978).

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Case Report

Palatogingival Groove: Management of an Innocuous Culprit of a Perio-endo Lesion

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Abstract:

Morphological defects occurring in dental structure can be sometimes predisposing factors for the onset of inflammatory processes in the periodontal and/or pulpal tissues. Palatogingival groove is one such defect, most frequently found on the lingual surface of maxillary laterals. Recognition of such a defect is critical and important, especially because of its diagnostic complexity and its further consequences. This case report discusses about the diagnosis and management of such a defect that predisposed the maxillary lateral incisor to periodontal defect leading to retrograde pulpitis.

Key Words: Palatogingival groove, Periodontal breakdown, Retrograde pulpitis, Bone graft.

Introduction:

Distolingual groove, radicular lingual groove, palato-radicular groove, corono radicular groove and palatogingival groove are synonyms for a mild developmental malformation that occur in the lingual aspect of maxillary incisors and have been described by Everett & Kramer (1972) and Robison & Cooley (1988). This malformation starts near the cingulum and runs in an apical direction for varying lengths up to the entire length of root (Kerezoudis et al, 2003). This anomaly is said to represent an infolding of the enamel organ and epithelial sheath of Hertwig (Walker & Jones, 1983), where as other workers claim this to be a resultant attempt of the body to form another root on the affected tooth (Kerezoudis et al, 2003). The groove was first mentioned in a dental anatomy text in 1917, later described by Zeisz Nuckolin (1949). In 1965, Prichard described this as a defect predisposed to the formation of periodontal pockets. Lee et al (1968) named this as the palatogingival groove.

It is the funnel shaped appearance which forms a niche for bacterial plaque and calculus accumulation making it difficult for the patient as well as professional to clean it properly. Inflammation may thus develop in the periodontal tissue adjacent to the groove leading to the detachment of junctional epithelium, periodontal destruction, pocket formation and alveolar bone loss (Kerezoudis et al, 2003). Deeper periodontal pockets may cause pulpal pathosis. Hence, it is essential to recognize this anomaly so that the consequences that may arise due to its presence can be managed effectively. This case report discusses with the diagnosis and management of a maxillary lateral incisor showing a palatogingival groove that predisposed it to retrograde pulpitis after periodontal breakdown.

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Case Report:

A 28 year old female reported to the department of Periodontics, ACPM Dental Collage and Hospital, Dhule, with the chief complaint of purulent discharge and swelling from gums in relation to upper left front tooth (22) for last 2 months. Examination showed localized swelling and an intraoral draining sinus pointing on the labial gingiva between the left lateral incisor and canine (Fig. Ia). There was no history of trauma, caries, nor was there any discoloration of the tooth. The palatal surface of lateral incisor showed fossa with mild calculus embedded in it (Fig. Ib). Periodontal examination revealed bleeding on probing and periodontal pocket more than 8mm deep on the distal aspect of the lateral incisor (22) along the groove. There was no mobility associated with it. To locate the origin of the sinus, a gutta percha cone was inserted into its course and another cone inserted along the groove, and a radiograph was taken (Fig. Ic). The cone inserted into the sinus pointed towards the apex of the tooth and the one inserted along the groove followed up to the depth of the periodontal defect.

Radiograph also revealed an angular defect. Following insertion of the cone along the groove, oozing of the purulent discharge from the sinus was noted.

On thermal and electric pulp testing, the associated tooth was found to be non-vital. Adjacent teeth elicited normal response. Findings were suggestive of retrograde pulpitis secondary to periodontal lesion.

Emergency access opening of root canal was done. The canal was enlarged up to 60 K file size and proper hermatic seal was achieved in obturation. A post obturation radiograph also revealed a radiolucent line running parallel to the main pulpal canal called as the parapulpal line (Fig. Id).

After satisfactory endodontic therapy, a decision to graft the bony defect was made. A full thickness mucoperiosteal flap was elevated on buccal and palatal aspects. The exposed root surface was planed with curettes and the exposed groove on the root was restored with glass ionomer cement after conditioning it with polyacrylic acid. Thorough degranulation helped in revealing a narrow, deep three walled intraosseous vertical defect extending upto 75%of the root length. Bone probing revealed around 10 mm deep defect (Fig. IIa). A sterile bone inductive demineralized bioresorbable xenograft (Osseograft) was placed in the defect under aseptic conditions (Fig. IIb). The flap was sutured with interrupted sutures using 3-0 mersilk. A periodontal dressing was placed. A course of antibiotics and analgesics (Amoxicillin trihydrate 500mg, metronidazole 400mg, and ibuprofen-paracetamol combination three times a day) was given. Chlorhexidine mouth rinse (0.2%) was prescribed for 2 weeks. Necessary post-operative instructions were given. Patient was recalled for suture removal after 10 days; the healing was observed to be satisfactory. The patient was put on maintenance therapy initially for three months, and when found symptom free, she was recalled every six months for follow up till 18 months (Fig. IIc). At the end of 18 months, probing depth was of 5 mm with 3mm gingival recession. Six months post-operatively, an intra oral periapical radiograph was advised (Fig. IId).

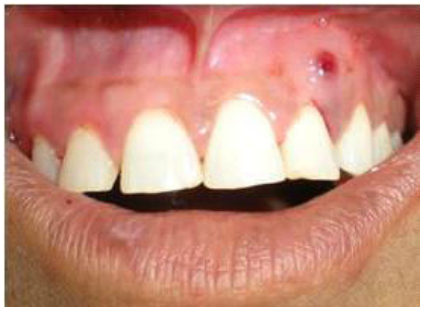

Fig.I(a). Intra oral sinus in relation to maxillary left lateral incisor.

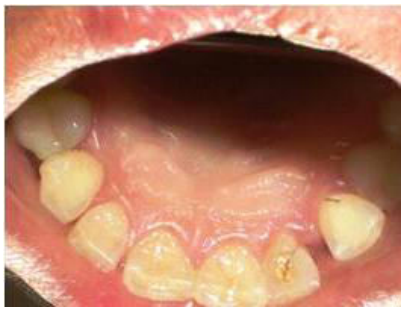

Fig.I(b). Presence of plaque and calculus in the defect.

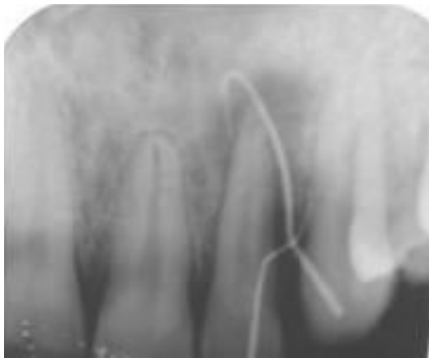

Fig.I(c). IOPA radiograph showing two gutta percha cones-one tracing through the sinus and other through the groove.

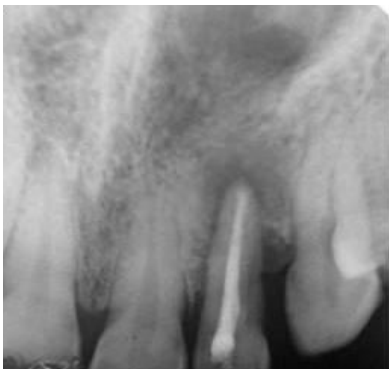

Fig.I(d).IOPA radiograph showing parapulpal line.

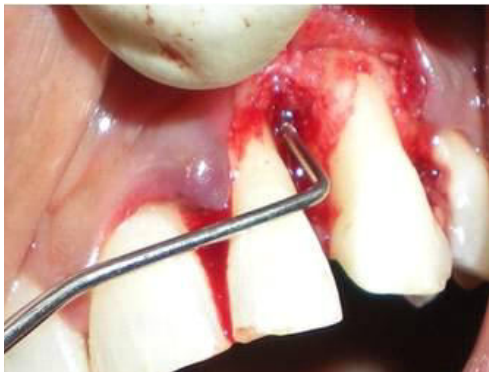

Fig.II(a). periodontal probing illustrates a 10mm defect in close relation to the groove.

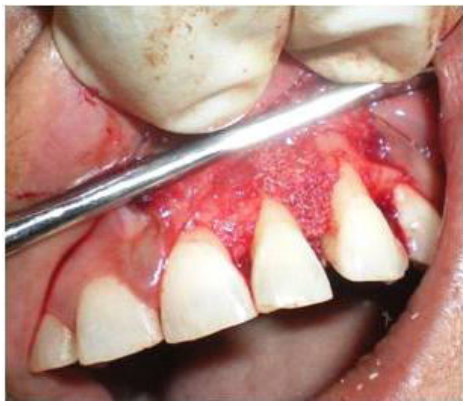

Fig.II(b). Bone graft placement into the defect.

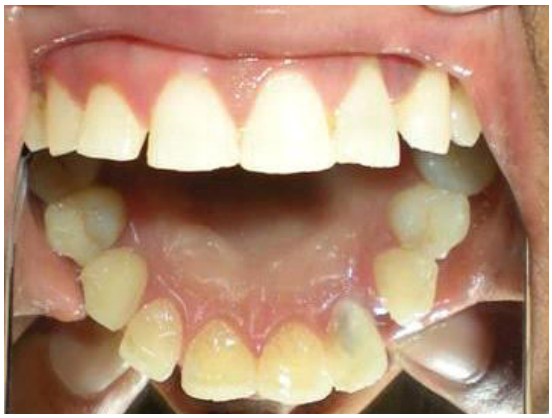

Fig.II(c).Healing after six months – facial view and palatal view.

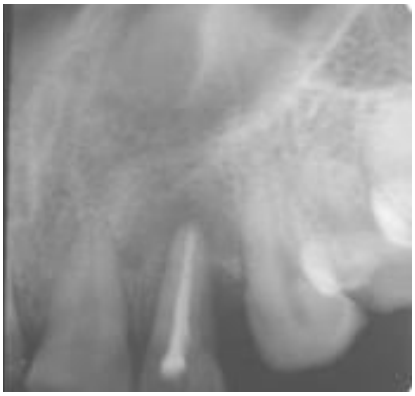

Fig.II(d).Post operative radiograph at the end of eighteen months.

Discussion:

Historically, the presence of this palato radicular groove is mentioned right from the development of mankind and its prevalence was said to be 12-21% during the megalithic period (Robison & Cooley, 1988). But there was no mention of potential of such an anomaly posing a periodontal and pulpal pathosis. Atkinson et al (1943) reported that the predominance of palatogingival groove in maxillary lateral incisor suggest possibility that the groove results from an undesirable position of the lateral incisor during the period of maxillary growth. The tooth although still a germ, becomes surrounded by the central incisors, canine and first premolar that are in a more advanced phase of dental development. Mineralization of the crown of the maxillary lateral incisor starts later compared with other teeth, making this germ, under these condition highly susceptible to folding (Lara et al, 2000).

The palatogingival groove may or may not involve a communication between the pulp cavity and the periodontal tissue. But it can be a etiological factor for the ensuing endodontic/ periodontal lesion in the absence of trauma, caries or restoration. It is the irregular funnel shaped feature on the lingual aspect that causes bacterial ingression through this groove along the root surface causing detachment of the junctional epithelium leading to periodontal breakdown. Once periodontal disease reaches the apex through the groove's depth, it can jeopardize the pulp, making it secondarily affected.

Diagnosis of a palatogingival groove is not always easy because the defect may manifest itself with symptoms of true periodontal disease or it may be expressed as a true endodontic lesion, or it may appear as a combined lesion. In some cases, the groove can be seen in periapical radiographs as a fine radiolucent line. The final diagnosis is greatly aided by detection of a notch in the lingual surface of the crown. In the present case, exploration of the lingual fossa revealed a funnel shaped defect obscured by plaque and calculus. Periodontal examination revealed a deep pocket running along the groove. The pulp was non vital. Hence, pulpal necrosis was first managed by endodontic therapy followed by conditioning and restoration of the groove by glass ionomer cement. Glass ionomer cement was used because of its antibacterial activity and its property of chemical adhesion to tooth structure. Clinical and histological studies have shown that there is an epithelial and connective tissue adherence to the glass ionomer cement during the healing process (Hans et al, 2010). Periodontal bony defect was grafted by Osseograft, a demineralized bone inductive xenograft shown to have regenerative properties. Other regenerative materials used by various authors include emdogain by Cecilia et al (1998) and hydroxyapatite by Ballal et al (2007) with successful results. In the present case, with osseograft, there occurred a reduction in the probing depth from 8 mm to 5mm after a period of 18 months. The patient was symptom free and there was no reoccurrence. However, the patient is being followed.

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Case Report

Hollow Maxillary Denture: A Simplified Approach

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Abstract:

It is the dentist's responsibility to fabricate a prosthesis incorporating stability, retention and support which ultimately provide satisfaction to the patient. But in the critical conditions such as long lip length or severely resorbed ridges with increased inter arch distance, the weight of a maxillary denture is often a dislodging factor. Hence, a light weight denture is required for better retention. This article describes a case of completely edentulous patient successfully rehabilitated with a hollow denture where a simplified technique of fabricating a light weight maxillary denture was used.

Key Words: Complete denture, hollow maxillary denture, inter ridge distance, light weight denture, residual ridge resorption.

Introduction:

Extreme resorption of the maxillary denture bearing area may lead to problems with prosthetic rehabilitation. These may be due to narrower, more constricted residual ridge as resorption progresses, decreased supporting tissues and a resultant large restorative space between the maxillary and mandibular residual ridge. Long lip length adds to this problem. This may result in a heavy maxillary denture that may further compound the poor denture-bearing ability of the tissues and lead to decreased retention and resistance (O'Sullivan et al, 2004).

The dentist should use his specialized training and prosthetic abilities to overcome the above stated problems with simple techniques. To decrease the leverage, reduction in the weight of the prosthesis would be beneficial (Brown, 1969l; el Mahdy, 1969). It improves the cantilever mechanics of suspension and overtaxing of the remaining supporting structures.

In this case report, edentulous old male patient with increased inter-ridge distance and long lip length was treated with a hollow maxillary denture, fabricated using Dental Plaster & Pumice (Prevest Denpro Ltd., Jammu)-Sugar syrup paste which is water soluble and can be readily removed without any difficulty.

Various weight reduction approaches have been achieved using a solid three dimensional spacer, including dental stone (Ackermen, 1955), cellophane wrapped asbestos (Worley & Kniejski, 1983), silicone putty (Holt, 1981) or modelling clay (DaBreo, 1990) during laboratory processing to exclude denture base material from the planned hollow cavity of the prosthesis.

Holt (1981) processed a shim of indexed acrylic resin over the residual ridge and used a spacer which was then removed and the two halves luted with auto polymerized acrylic resin.

Fattore et al (1988), used a variation of the double flask technique for obturator fabrication by adding heat polymerized acrylic resin over the definitive cast and processing a minimal thickness of acrylic resin around the teeth using different drag. Both portions of resin were attached using a heat polymerized resin.

O'Sullivan et al (2004) described a modified method for fabricating a hollow maxillary denture. A clear matrix of the trial denture base was made. The trial denture base was then invested in the conventional manner till the wax elimination. A 2mm heat polymerized acrylic shim was made on the master cast, using a second flask. Silicone putty was placed over the shim and its thickness was estimated using a clear template. The original flask with the teeth was then placed over the putty and the processing was done. The putty was later removed from the distal end of the denture and the openings were sealed with autopolymerizing resin.

The technique was useful in estimation of the spacer thickness, but removal of the putty was found to be difficult especially from the anterior portion of the denture. Moreover, the openings made on the distal end had to be sufficiently large to retrieve the hard putty.

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Case Report:

A 55year old male patient reported to the Department of Prosthodontics with the chief complaint of difficulty in chewing food and heaviness in his upper denture. History revealed that patient was edentulous for past 18 years and had used many sets of complete dentures. On examination, it was found that patient was dolicocephalic. Both maxillary and mandibular ridges were severely resorbed. His upper lip was long, the inter-ridge distance was more than normal and vertical dimension of occlusion(VDO) and vertical dimension at rest (VDR) were more than average (Fig. I). The previous denture of the patient was heavy with attrited teeth and was under extended. Hence, it was decided to fabricate a new set of denture for the patient. The treatment options for complete denture available to the patient were:

a. Implant supported complete denture
b. Conventional Complete denture
c. Hollow maxillary complete denture and conventional mandibular complete denture.

After analysing each available option, it was decided to fabricate hollow maxillary complete denture. The patient also approved of the treatment modality as it was light in weight, inexpensive and non-surgical procedure.

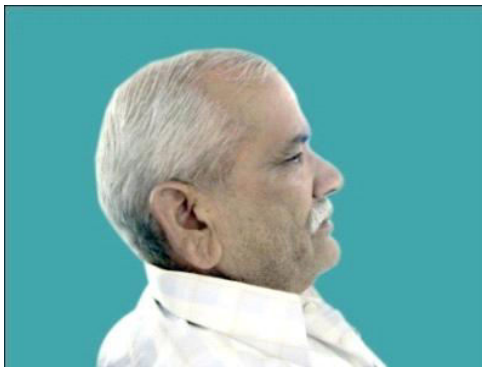

Fig. I: Preoperative extraoral profile view.

Technique:

Preliminary and final impressions were made in conventional manner. At the time of jaw relation due consideration was given to adjust maxillary occlusal rims properly as to provide proper aesthetics to the patient with long upper lip. Teeth were selected and arranged in balanced occlusion and try-in was done first for anterior teeth and then for posterior teeth.

For making the Maxillary denture hollow interchangeable flasks were used. The trial dentures were processed in the standard manner upto the wax elimination stage (Fig. IIa). The maxillary trial denture base was sealed (on the definitive cast) with the modelling wax and a second flask was used to invest the modelling wax till the wax elimination stage. The cope (upper half of the flask/cavity side) was packed and processed with heat polymerizing resin (Trevalon, Dentsply, Gurgaon). This permanent record base was left undisturbed on the master cast (Fig. IIb).

Dough of Dental Plaster-Pumice and Sugar syrup was made and rolled. It was then placed over the heat cure record base (it acted as a spacer) (Fig. IIIa). To harmonise the space for heat cure resin, strips of modelling wax was placed on the ridge lap area of acrylic teeth including the buccal and palatal surface in the cope (Fig. IIIb). The two halves of the flask were closed and then reopened. The thickness of the wax was then assessed with the help of the wax gauge and necessary modifications were done(spacer material was scraped wherever the wax was exposed or thinned out). This process was further repeated till the uniform

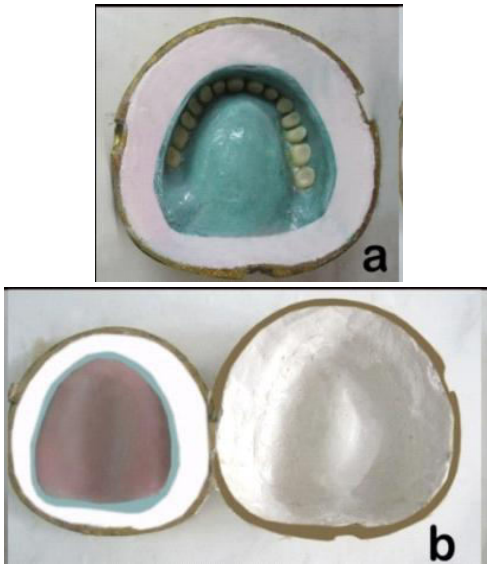

Fig. II: Interchangable flasks: (a) Dewaxed flask; (b)Permanent record base.

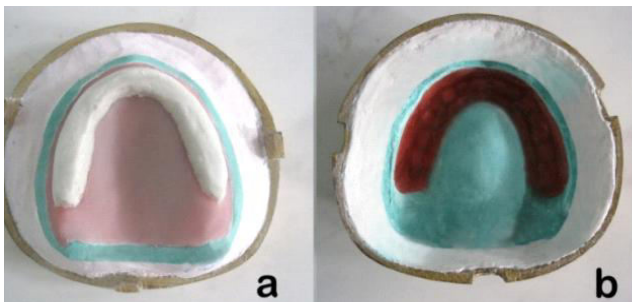

Fig. III: (a) Dough of Dental Plaster-Pumice & Sugar syrup; (b) Adapted gauged wax strip

thickness of the wax was achieved and thus ensured uniform space of 1.5-2mm for the heat cure acrylic resin.

Wax strip was then removed from the acrylic teeth. The heat polymerizing resin was then mixed, packed and processed for 7-8 hours (as per the manufacturer's instructions). After curing, lab-remounting was done and the processing errors were corrected.

Two small openings were made with a bur into the denture base distal to most posterior teeth to remove the spacer (Fig. IVa). The Dental Plaster- Pumice- -Sugar syrup paste was then removed by scraping and putting it in water (dough dissolves easily in water). The cavity was cleaned and disinfected. Later, these openings were closed with the autopolymerizing resin (Trevalon,Dentsply,Gurgaon) in dough stage(Fig. IVb). The dentures were then polished in usual manner. The sealing of the cavity was then verified by placing it in water and checked for any bubbles(Fig. IVc). The dentures were inserted in the patient's mouth and instructions were given (Fig. V).

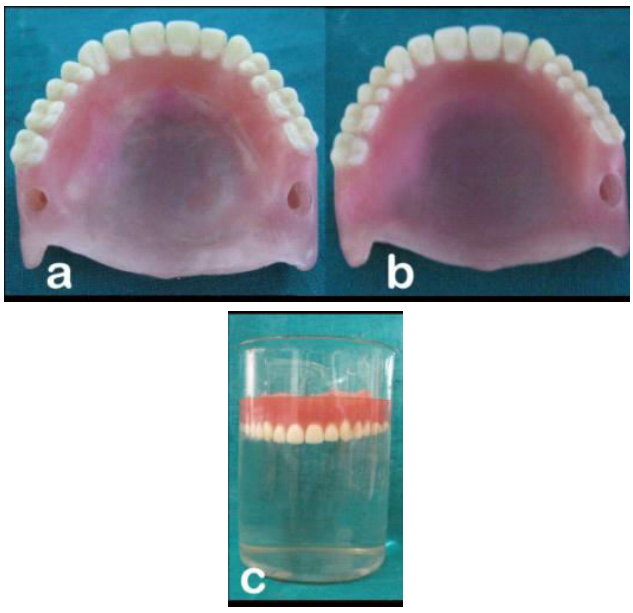

Fig. IV: (a)Denture with open channels for spacer removal; (b) Sealed channel; (c)Light weight hollow denture

Discussion:

Rehabilitation of patient with severely resorbed ridges and long lip length is a challenge to the dentist. Even though, the choice for rehabilitation can be implant supported overdenture, and ridge augmentation but many a times the patient who come with such a problem are geriatric patients with systemic illness, economic constrains, possess reluctance for a long

Fig. V: Post operative Frontal view.

duration treatment procedure and unwillingness for any kind of surgical procedure. Hence, the best way is to rehabilitate them with the conventional way. Apart, from modifying the impression technique to get maximum denture bearing area, modifying the type of denture may also be better accepted by the patient (Kalavathy et al, 2010).

In general, a conventional (heavy) denture whether maxillary or mandibular is likely to cause poor denture bearing ability. Extensive volume of the denture base material in prosthesis provided to patients with large maxillofacial defects or severe residual ridge resorption is always a challenge to prosthodontists. To increase the retention and stability of heavy prosthesis, many methods have been tried like utilising the undercuts, modifying the impression technique, use of magnets, use of implants, etc (Kalavathy et al, 2010). The prosthodontic treatment plan chosen for this patient was based on several findings noted during case history and examination. Resorbed residual ridge (compounded with long lip) length resulted in increased interridge distance. If conventional maxillary denture was constructed then it would have resulted in increased weight of the maxillary denture that may result into resorption of maxillary edentulous foundation at a higher rate.

Reducing the weight of maxillary prosthesis, however, has been shown to be beneficial when constructing prosthesis for rehabilitation of edentulous patient. This can be achieved by making the maxillary denture hollow.

The method in this case report has advantages over previously described techniques for the hollow denture fabrication. Plaster-Pumice-Sugar syrup readily dissolves in water and can be easily removed, unlike the tedious efforts made to remove putty from the denture especially from the anterior region. Moreover, the openings made for spacer removal was

also small compared to the openings made for the other varieties of spacer used. The thickness of the resin can be controlled by adapting an even thickness of wax sheet all around after measuring it with wax gauge. This will ultimately ensure even depth of resin to prevent seepage and prevent deformation under pressure of flask closure.

The advantages of hollow dentures are reduction in the excessive weight of the acrylic resin, resulting in the lighter prosthesis making the patient more comfortable.

Source of Support : Nil.
Conflict of Interest: None declared.

Summary:

Hollow maxillary denture is the best method of rehabilitating the patient with severely resorbed ridge and long lip length. It not only reduces the weight of the denture but also the leverage action of the same. This ultimately results in increased retention and stability and upto some extent it is also possible to preserve the existing residual alveolar ridge. This technique is simple to execute and allows control of spacer thickness. Light denture weight for healthy and comfortable living.

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Case Report

Klippel-Trenaunay Syndrome - A Case Report

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Abstract:

Klippel-Trenaunay Syndrome (KTS) is a sporadic disorder characterized by the triad of vascular malformation (capillary hemangioma or port wine stain), venous varicosity and soft tissue and/ or bony hypertrophy. We report here a case of Klippel-Trenaunay syndrome with review of literature.

Key Words: Klippel-Trenaunay syndrome, KTS, Port wine stain, venous varicosity.

Introduction:

Klippel-Trenaunay syndrome (KTS) is a rare disorder with an incidence of 3-5/1,00,000 (Suchithra et al, 2008) . It is characterized by the triad of vascular malformation (capillary hemangioma or port wine stain), venous varicosity and soft tissue and/ or bony hypertrophy. The vascular malformation is usually limited to a single extremity, though multiple extremities can be involved. Alternative names given for Klippel-Trenaunay Syndrome are Klippel-Trenaunay-Weber syndrome; Angio-osteohypertrophy; Nevus varicosus osteohypertrophicus syndrome; Hemangiectasia hypertrophicans and Nevus verucosus hypertrophicans.

Case report

One year old child born out of non-consanguinous marriage presented in the OPD with history of progressive enlargement of left lower limb since birth (Fig. I). He had high grade fever for last 3 days. On examination, he had marked hypertrophy of the left lower limb. There was a large port wine stain on left gluteal area and posterior aspect of thigh along with few small stains over left leg (Fig. II). Multiple discrete and grouped deep red to bluish black papules and nodules were present over the port wine stain. He was pale with hepato-splenomegaly. Routine hematological examination showed microcytic, hypochromic anemia with moderate anisocytosis. Peripheral smear was positive for P. vivax which explained the cause of fever. Liver function test revealed raised indirect serum bilirubin, which could be explained by hemolysis due to malaria.

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Doppler of the local area showed venous malformation with diffuse hypertrophy of soft tissue of the left leg and thigh with no arterial malformation in the region.

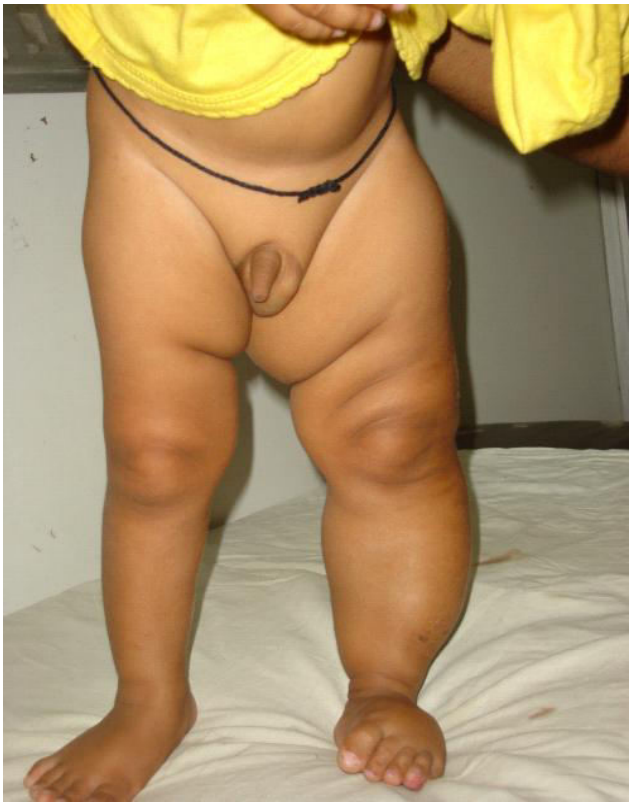

Fig. I: Left lower limb hypertrophy.

T2 weighted MR angiography revealed markedly hyperintense contrast enhancing soft tissue swelling predominantly in subcutaneous tissue in left gluteal region, extending medially to left scrotal sac and inferiorly involving thigh. It also involved significant part of muscles on the posterior aspect of leg and some involvement of postero-lateral aspect of thigh. It showed mild prominence of draining vein (Fig. III). These findings confirmed that it was a predominantly

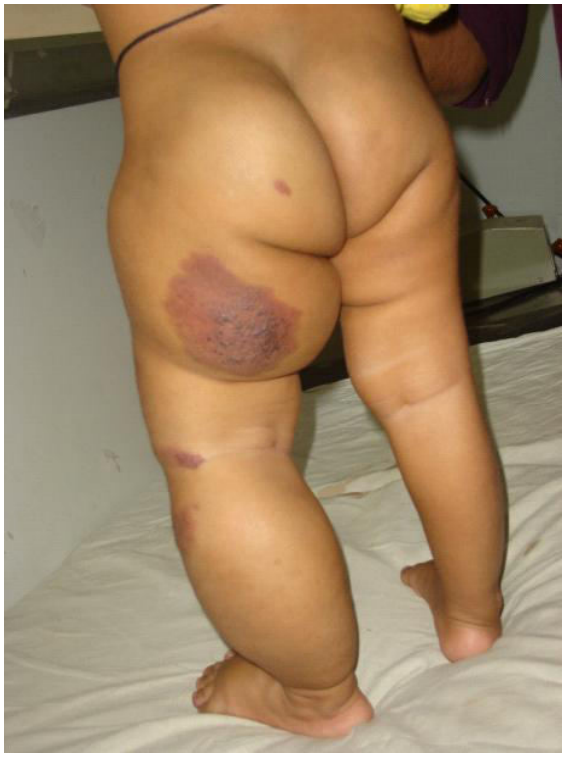

Fig. II: Port wine stain on left gluteal area and posterior aspect of thigh with few small stains over left leg.

soft tissue swelling containing pauci vascular hemangioma. As the child did not have any complication, parents were reassured and appraised of the possible complications and were advised to come for regular follow up for limb length monitoring.

Discussion:

Klippel-Trenaunay Syndrome was first described by two French doctors, Klippel and Trenaunay in 1900. It is a triad of vascular malformation, venous/lymphatic varicosity and soft tissue and bony hypertrophy (Klippel & Trenaunay, 1900). Hemangiomas are often apparent at birth or by second week of age (Samuel & Spitz, 1995).

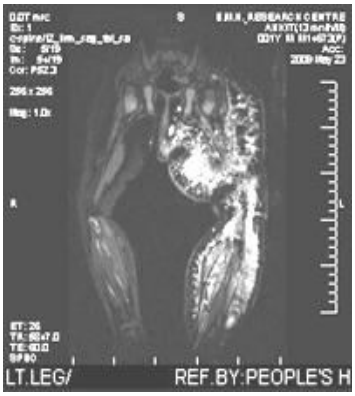

Fig. III: T2 weighted fat saturation image of left lower limb.

Capillary hemangiomas are the most common type and are called port wine stains due to its red and purple coluor. If large enough, cutaneous hemangiomas may cause sequestration of platelets, leading to Kasabach-Merritt syndrome, a type of consumptive coagulopathy. The hemangioma often overlies the vascular malformation. Varicose veins result from damaged or defective valves in a vein. Vein gets damaged when the smooth muscle in the wall of vein weakens and the valves cannot support the weight of blood. Bone and soft tissue hypertrophy is a result of increased growth. In many cases, limb length is affected. In most cases, the girth of the limb is larger, although atrophy is seen in some patients. The lower limb is involved in about 95% of patients while upper limb involvement is seen in 5% (Phadke, 2009). Rarely only the trunk is involved. It affects males more than females.

When Klippel-Trenaunay Syndrome is associated with arteriovenous fistula, it is known as Klippel-Trenaunay-Weber Syndrome (KTWS; Weber, 1907).

A series of 252 patients with KTS was studied at Mayo Clinic, Rochester between January 1956 and January 1995. It showed presence of capillary malformations (port-wine stains) in 246 patients (98%), varicosities or venous malformations in 182 (72%), and limb hypertrophy in 170 (67%). All three features of KTS were present in 159 patients (63%), and 93 (37%) had two of the three features. Atypical veins, including lateral veins and persistent sciatic vein, occurred in 182 patients (72%; Jacob et al, 1998). Other less common manifestations of KTS include thromboembolic episodes, thrombophlebitis, Kasabach-Merritt syndrome, haematuria, rectal or colonic bleeding, vaginal, vulval or penile bleeding in children with visceral and pelvic haemangiomas. Kasabach-Merritt syndrome can present as high output failure. Neoplastic risk is not increased in KTS.

Although the cause of KTS is still unknown, it is hypothesized that it is caused by a mesodermal abnormality during fetal development leading to vascular and soft tissue malformations in the affected limb (Baskerville et al, 1985). McGrory & Amadio (1993) believed that an underlying mixed mesodermal and ectodermal dysplasia was responsible for development of KTWS. Klippel-Trenaunay Syndrome might develop due to a single gene defect (Happle, 1993). Rarely it can be inherited as an autosomal dominant trait (Cebllos-Quintal et al, 1996). Whelan et

al (1995) reported a case of a girl with KTW syndrome associated with a reciprocal translocation: t (5;11)(q13.3;p15.1). The de novo translocation t (8;14)(q22.3;q13) has also been reported (Wang et al, 2001). The association between the angiogenic factor gene *AGGF1* and KTS appears to be significant (Hu et al, 2008).

No definitive treatment is possible for KTS. Imaging studies like contrast enhanced MRI, Ultrasonography and Doppler study may be needed for diagnosis and to find out the extent of lesion that helps in planning the interventions if indicated. Treatment is indicated to reduce the symptoms and the risk of complications. Active intervention needs to be attempted only for localized lesion or in presence of serious complications like bleeding or cardiac failure. Options available to treat the symptoms of KTS are surgery, sclerotherapy, and compression therapy. Laser treatment of the hemangioma can be effective in lightening the color of the port-wine stain. Currently, the flashlamp-pumped pulsed dye laser is the treatment of choice in vascular lesions. It is also indicated in the presence of ulceration. When treated with laser, ulcers heal more quickly. Laser treatment is most effective when performed early. Multiple sittings are required to achieve the desired effect.

Different surgical interventions for varicose veins include vein ligation, vein stripping, vein resection, and amputation. Vein ligation is a procedure which clamps or ties off a section of veins. It prevents blood flow through the damaged veins and promotes blood flow through normal veins. Vein stripping uses a metal wire to remove varicosities from within the damaged vein. Lindenauer (1965) suggested that the deep venous system is atretic in KTW syndrome, so stripping of varicose veins is unwise. Vein resection, or excision removes a section of damaged veins from the body. Endovenous Thermal Ablation is a newer version of ligation and stripping of veins. In the procedure a laser or high frequency radio waves are given to produce intense heat locally in the varicose vein. It is less painful with fast recovery. In some cases, amputation of involved digits or extremity have to be done.

Sclerotherapy can be done by using chemicals like sotradecol, ethanolamine, and absolute ethyl alcohol. It stops the blood flow through defective veins by causing inflammation in the inner lining of the veins. The vein later collapses and absorbed by the body. Debulking procedures have limited use and may damage venous and lymphatic structures leading to increased edema in the affected limb.

Compression garments are indicated for chronic venous insufficiency, lymphedema, recurrent cellulitis and recurrent bleeding from capillary or venous malformations. Compression garments also protect the limb from trauma. Various compression garments available are compression socks, elastic wraps, neoprene wraps and other more complex devices. Many studies have given positive results in patients using compression therapy (Stringel & Dastous, 1987). Cellulitis and thrombophlebitis can be managed with analgesics, elevation, antibiotics, and corticosteroids. Radiotherapy may help to induce regression of hemangiomas though the results are slow to develop. Complications due to hemangioma include ulceration, bleeding, and secondary infection.

Complications of varicosities include paresthesia, ulcers, dermatitis, pulmonary embolism, thrombophlebitis, hemorrhage, and cellulitis.

Hypertrophy of a limb may lead to vertebral scoliosis and gait abnormalities. It can cause degenerative joint disease also.

Regarding limb hypertrophy, heel inserts are generally sufficient for limb length discrepancies of 1.5 cm or less. If projected leg length discrepancy exceeds 2.0 cm at skeletal maturity, it can be treated by epiphysiodesis in the growing child.

Patients with KTS should be monitored at least annually and more often if clinically indicated. Stable disease can be followed clinically. If the disease progresses, imaging studies should be performed and medical or surgical intervention should be pursued if indicated.

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Review Article

Flexible Partial Dentures - A hope for the Challenged Mouth

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Abstract:

The strong, flexible nature of flexible denture material is perfectly suited to the variety of natural conditions in the mouth, simplifying design and enabling the flexible nylon resin to act as a built-in stress-breaker that provides superior function and stress distribution. Partially edentulous patients with challenging conditions like abused ridges, allergy to denture resins, undercuts due to angulated remaining teeth, cancerous lesions and cleft palate pose a great challenge for the fabrication of a successful removable partial denture.

Flexible denture offers a simpler and cost effective treatment for the oral rehabilitation of such cases. Flexible nature of the material allows shifting of the burden of force control from the design features of the appliance to the material properties of the base material. The clinical procedures are simple not requiring any expertise. A cast model prepared from a conventional alginate impression is sent to the laboratory that fabricates the desired prosthesis.

The stress distribution of the partial denture is accomplished by flexibility of the major connector, behaving as a stress-breaker. The tissue-supported saddles float on the edentulous ridge independently, without placing a stress load on the abutment teeth. In the long term, the flexibility of the complete or partial denture also appears to act as a tissue conditioner. Flexible partial dentures certainly offer advantages over conventional partials by way of superior aesthetics, better function, durable material and longevity of the prosthesis.

Key Words: Flexible dentures, Removable Partial Denture (RPD), Undercuts, Acrylic clasps

Introduction:

Modern dentistry offers many options for the restoration of partially edentulous mouth, like removable partial dentures (RPD), fixed bridges and dental implants. Removable partial dentures became very popular many decades ago with the introduction of acrylic polymers and chrome cobalt alloys in dentistry. Many patients choose removable partial dentures due to factors ranging from cost to physiology. Today, more dentists are advising flexible partial dentures because they make better and stronger appliances that are comfortable and long lasting (Naylor & Manor, 1983). The strong and flexible nature of the material is perfectly suited to the variety of natural conditions in the mouth, simplifying design and enabling the flexible nylon resin to act as a built-in stress-breaker in order to provide superior function and stress distribution in a removable partial denture.

Prevailing Materials:

Acrylic partial dentures offer a relative ease of fabrication as compared to the metal frame fabrication. The cast partials require accurate tooth preparations for guide planes and placement of occlusal rest. Very accurate surveying is required on the diagnostic cast to help inform about the tooth preparation (Lowe, 2004). However, the main limitations from these materials come from a steady loss of function as the edentulous ridge undergoes a natural process of resorption and the obvious non-aesthetic visible metal clasps (Shamnur et al, 2005). The patient needs to maintain the partial dentures routinely in terms of clasp adjustment and relines, and if any of the requirements are slightly compromised, the design will fail to work as intended. Irrespective of the accuracy with which the metal partial denture is designed for its fit, this perfection is gradually lost after the partial denture is placed for the reasons cited above.

The need to make improvements in the lives of people using removable partial dentures, inspired further research in this particular field of dentistry. Limitations of function and cosmetics of framework supported removable part of RPDs, which created a need to fundamentally change the technique of designing and fabrication of RPD. This is what led to the introduction of Flexible Dentures in the late 1940s. Two young brothers, Arpad and Tibor Nagy, had the vision to experiment with the new polymers of the day

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(nylon) to create a type of partial denture that was able to address the fundamental requirements of retention, support and stability, at the same time it provides beautiful aesthetics that was far superior to their metal counterparts, (Kaplan, 2008; Fig. I).

Their research gave birth to what is known today as Valplast – a Flexible denture material. The product was introduced in order to improve upon both the aesthetic and functional limitations of conventional removable partial denture. It was also developed to give a more affordable aesthetic restoration that can be expected to provide long-term function (Goiato et al, 2008).

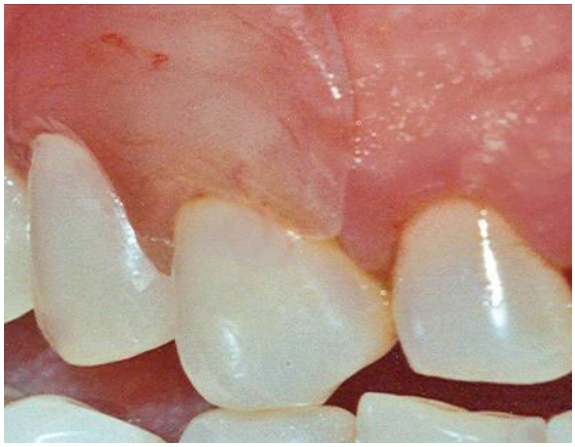

Fig. I: A more aesthetic clasp of Flexible RPD as compared to metal.

Functional Benefits of the Flexible Material:

The functional advantages of the flexible materials are somewhat less obvious. The key to the functional benefit is in the flexibility of the material that helps to shift the burden of force control from the design features of the appliance to the properties of the base material. A lever is more efficient if it is made from a rigid material. Leverage is the critical component of the conventional RPD design that can be controlled using flexible materials. A flexible lever does not work well as a lever. Therefore, a flexible partial denture reduces the leverage effects of its extensions without compromising good retention and support.

Occlusal Rests:

There is no need of an occlusal rest or vertical stop in the flexible partial denture (Zhao et al, 2003). The occlusal rest is a structural component of the rigid partial, whose specific function is to compensate for potentially damaging stresses resulting from the fulcrum effect of a rigid major connector. This function is frequently over-simplified, the idea is that the occlusal rest is designed to keep pressure off the residual ridge. Actually, this simplification may be an unintended side effect of the true function, which is to resist force imbalance due to the combination of tooth and tissue support in a rigid framework. The flexible base eliminates the need of an occlusal rest since the stress distribution is naturally in balance (Fig. II).

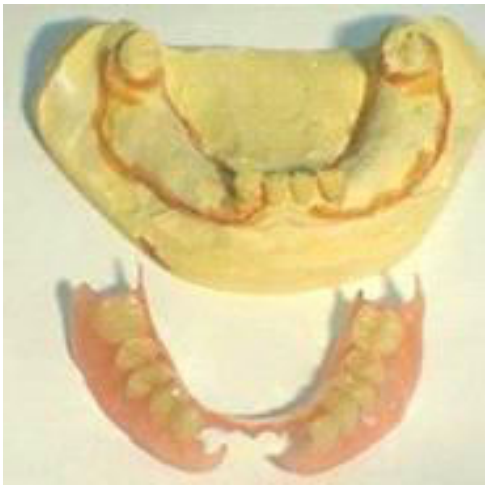

Fig. II: Better stress distribution of Flexible Denture Base without occlusual rests.

Stress distribution:

The stress distribution in the rigid partial denture is controlled by structural elements of the design; specifically the cooperative relationship of the retentive clasp, occlusal rests, reciprocating clasps, minor connectors, and guide planes, if used. The stress distribution of the flexible partial is accomplished by flexibility in the major connector behaving as a stress-breaker. The tissue-supported saddles float on the edentulous ridge independently, without placing a stress load on the abutment teeth. In distal extension partials, the free end saddle equally distributes force at all points along the edentulous ridge (Fig. III, IV).

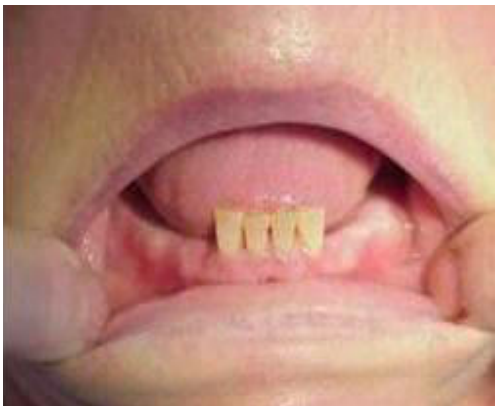

Fig. III: A bilateral lower posterior edentulous mouth.

Preservation of tissues:

In the long term, the flexibility of the partial also appears to act as a tissue conditioner. The slight movement over the tissue stimulates the blood circulation under the partial, and dynamic transfer occlusal forces appears to reduce the atrophy that can set-in beneath a saddle that does not engage the tissue and bone (Parvizi et al, 2004). At the same time, flexibility of the major connector eliminates the fulcrum effect across the arch. The fulcrum is one of the behavioral components of the conventional rigid RPD that must be compensated for by structural design of the retention, rest, and passive retainers. We also have the concept of Wolff's Law from orthopedic theory. Wolff's Law refers to the correlation between bone regeneration and behavior with physiological force. When force applied to bone structures are within physiological norms, the bone responds by achieving and stabilizing with physiologically normal mass and density. When force is below normal, bone responds by resorbing or shrinking. When force is excessive, bone responds by growing to above-normal mass and density. We would typically expect to see atrophy in the ridge where ridge is not being engaged in mastication. When the ridge is excessively engaged, we would see re-apposition. When the ridge is engaged normally, we would expect to see normal and stable bone mass and density. This concept is actually what allows implants to work as well as they do. The implant creates a normal environment for the supporting bone (Meijer & Wolgen, 2007). While no partial will replicate this exactly, the tissue-bearing partial comes closer than the tooth-supported partial. The only factor to consider is balancing the force distribution over the edentulous ridge, not whether or not to engage it at all.

Advantages of Flexible Partial Dentures:

Metal-free restorations and prosthesis are future of dentistry. Flexible partial is the optimal choice whenever partial is the choice of treatment or the patient prefers not to use a fixed restoration. Patients, who have used both conventional RPD and a Flexible partial, report that the later feels more natural and is more comfortable to wear. It also provides a higher standard of function by using the flexibility of the material to balance masticatory forces over the entire supporting ridge instead of individual support points (Phoenix et al, 2004). As a result, the balanced distribution of forces can often lead to longer lasting appliances that may not require frequent relines.

Following are some of the advantages of a flexible partial denture:

- More acceptable esthetics, since there are no metal clasps.
- The material has good flexibility like Titanium. Therefore, even if there is a little bit of bending, it comes back to the original shape and position.
- Ease of insertion in the mouth with alveolar undercuts because of the flexibility.
- Even if there is slight shifting of the remaining teeth over time, the flexibility of the denture material, allows the use of prosthesis with little adjustment.
- There is no need of modification of the remaining teeth to receive occlusal rests as for the metal clasps.
- In cases of undercut due to tilted teeth, flexibility of the material makes it possible to insert the prosthesis over the angulated teeth.
- The denture can be heated up in hot water for about a minute and can easily be adjusted and inserted in the undercut area.
- Rebasing (Changing the entire plastic / tissue area except the acrylic teeth) is possible.
- A real boon for patients with compromised oral conditions. Opens up scope to address the needs of such patients with ease.

Disadvantages of Flexible Partial Dentures:

- Being a plastic material, it cannot be made into thin sections like metal. It is likely to break if cut thin sections.
- Since they need to be made bulkier than cast partials, it may take longer to get used to a flexible partial denture.
- It does not conduct heat and cold like metal. Therefore, the patient may not enjoy certain food like hot soup or ice cream.
- Since flexible dentures utilize the gaps (because of some missing teeth) for the 'Retento-Grip Tissue-bearing Technique' (Iselin et al, 1990) for retention, the remaining teeth have to be in fairly good periodontal health.
- The patients that have periodontal problem may have several teeth that are mobile due to bone loss. Therefore, the whole area keeps on flexing causing unfavorable forces that in turn result in more bone loss.
- The laboratory fee is a little higher.

7. Requires more chair-side time for adjustment.
8. Requires special instruments (knives and polishing kit) to make the adjustment.
9. A Flexible denture is very hard to repair if fractured. No additions can be made onto it. In such cases, rebasing is recommended.

Indications for flexible partial denture:

The appropriate and acceptable uses for a flexible partial denture include all cases of conventional partial denture indications plus the areas where conventional partials are limited or contra-indicated. There are virtually no cases where a conventional partial would work better than a flexible partial. Flexible denture materials like Valplast are available in five natural tissue shades as well as in additional un-pigmented option for special applications (Iselin et al, 1990). The unique physical properties of the material also make it more adaptable in challenging cases and situations involving pediatric patients, cancerous mouths and cleft palates. Because of its excellent biocompatibility, it is also an ideal replacement for acrylic when patients are allergic to denture acrylics. Flexible partials could be a treatment of choice in cases of patients having a history of repeated partial denture frame breakage. They can also be used as an easy and affordable alternative to implants or fixed partial dentures and also for tooth or tissue-coloured clasps in high esthetic areas.

Additional applications of Flexible denture material include:

1. Cosmetic gum veneers
2. Bruxism appliances
3. Implant retained over-dentures and full dentures for patients with protuberant bony structures or large undercuts
4. Unilateral Space Maintainers (Fig. V, VI)
5. Temporary Prostheses (short and long-term)
6. Obturators and speech therapy appliances
7. Orthodontic Devices
8. Occlusal splints and sleep apnea appliances
9. Anatomical bite restorer (Used during full mouth rehabilitations)

Flexible Partials For People With Special Needs:

The safety issue is important to many people in high physical risk exposures. Flexible Partials are ideal for people in high-risk situations like:

- Athletes
- Police and Firefighters
- Military Personnel
- Prisoners and Prison Officers
- Any person who might be exposed to physical harm or injury

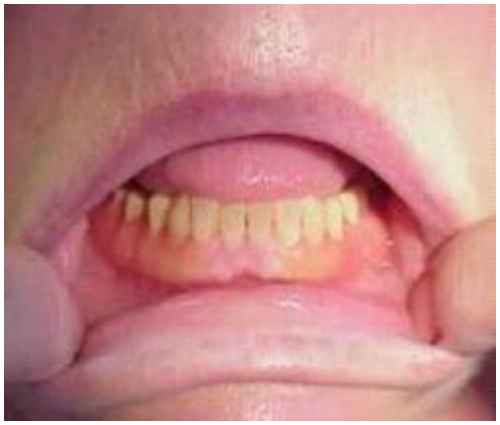

Fig. IV: A Tissue supported RPD avoides stress on the remaining Teeth

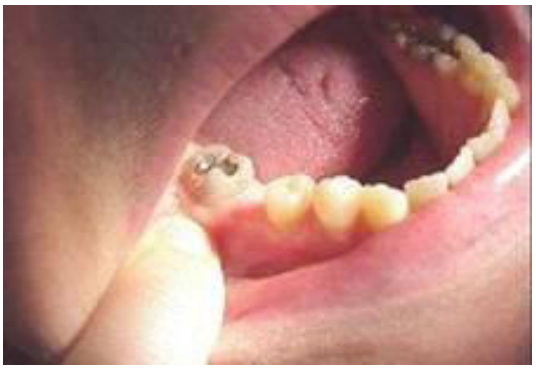

Fig. V: Unilaterally missing single manibular molar.

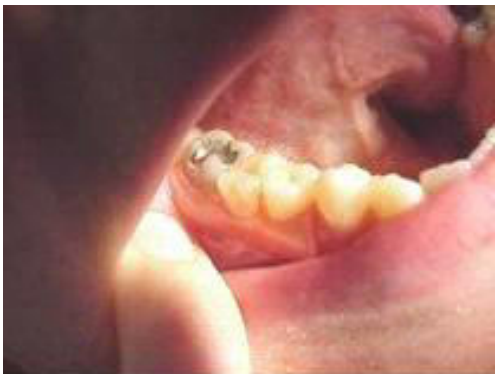

Fig. VI: A Flexible RPD for a unilaterally missing mandibular molar serves as a satisfactary space maintainer

Contraindications:

Contra-indications include patients who simply should not or would not wear any type of removable appliance. However, Flexible partials are not advisable in cases of:

1. Deep overbites (4mm or more) where anterior teeth can be dislodged in excursive movements
2. Little remaining dentition with minimal undercuts for retention.
3. Where there is less than 4 mm of inter-occlusal space in the posterior area.
4. Bilateral free-end distal extensions with knife-edge ridges or lingual tori in the mandible.
5. Bilateral free-end distal extension on maxilla with extremely atrophied alveolar ridges.

Conclusion:

No product can solve all the problems associated with partial prosthesis. Nor can it meet all the requirements of a challenged mouth. The key is to solve and address as many problems and needs as possible in a simple way that is affordable for the patient. An effort has been made to focus on improvements over conventional partials in aesthetics, function, durability, and longevity of a Partial Denture made from a Flexible denture material. With further improvisations in the working techniques, adjustments and repair potential of the material, Flexible partials may become a simpler answer to complex partially edentulous oral conditions.

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